NOVEMBER 1982
75p

COMPUTER & VIDEO GAMES

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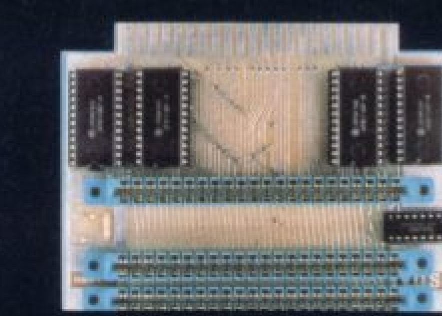
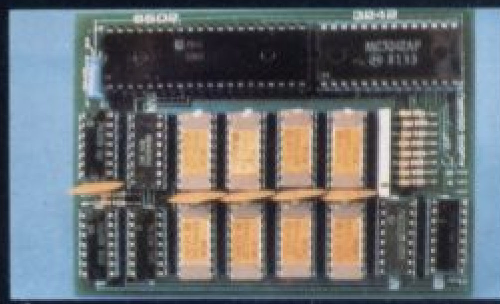
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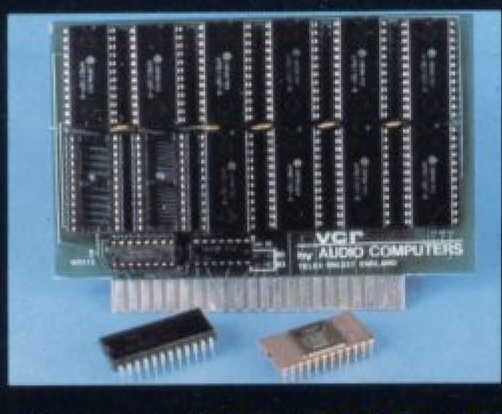
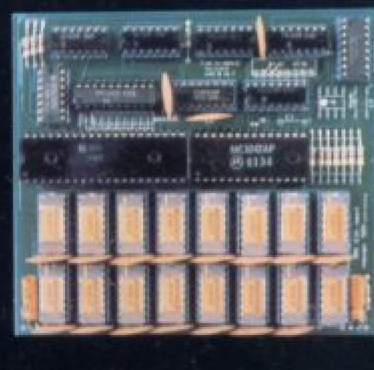




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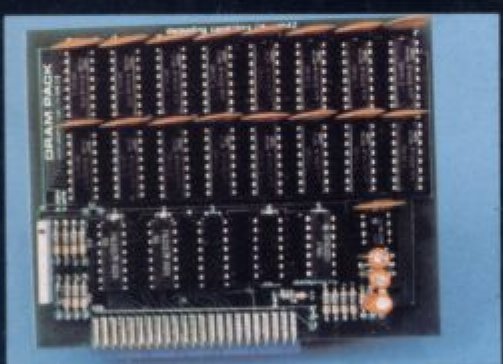
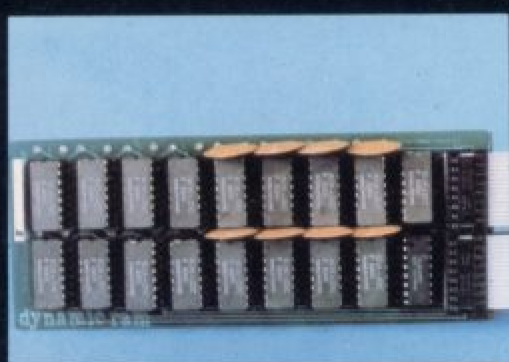
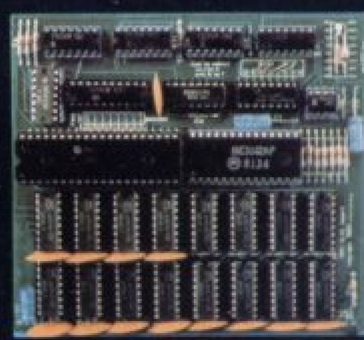
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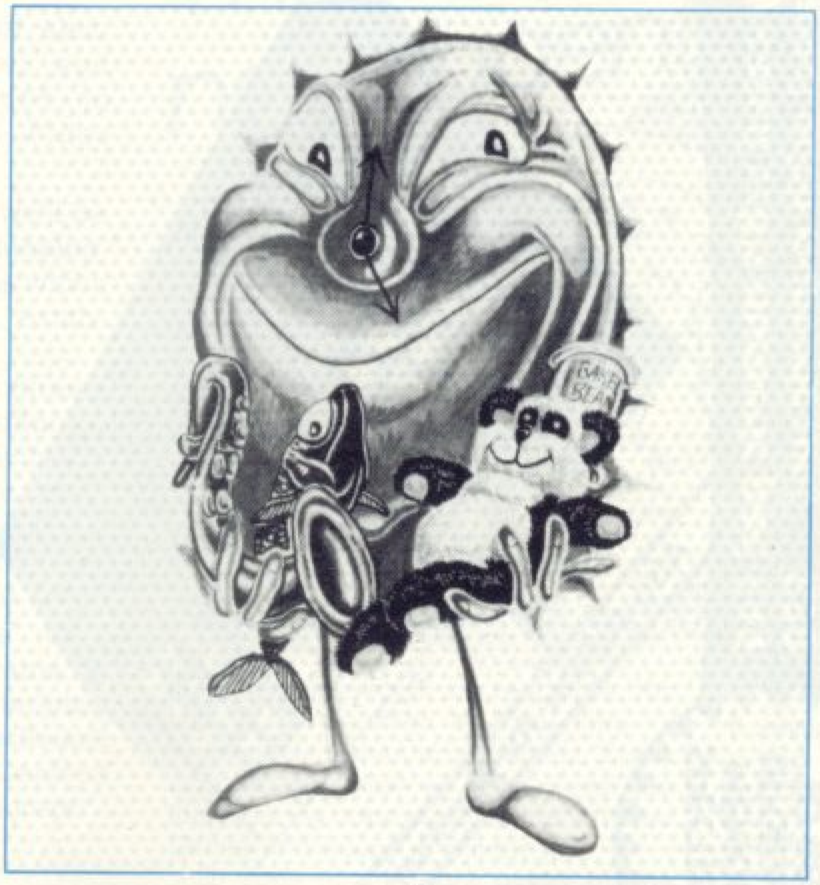
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COMPUTER & VIDEO GAMES

CONTENTS

NOVEMBER 1982 No. 13



Lost treasure...

A specially commissioned gold and diamond prize valued at £6,000 is on offer to Spectrum owners.

Automata Cartography is the software house which will give the prize to the first person to solve its elaborate computer adventure, Pimania.

The prize is called the Golden Sundial of Pi and an exclusive report on this *Masquerade*-like quest can be found on page 85.

Puzzling is the start of a new column which takes over from our old Brainware feature. It should provide something for everyone with a few moments to while away. See page 72.

News & Reviews

Listings







Features

Editor Terry Pratt, **Staff Writer** Eugene Lacey, **Editorial assistant** Susan Cameron, **Production editor** Tim Metcalfe,
Advertisement manager Rita Lewis, **Advertising executive** Neil Wood **Advertisement assistant** Louise Flockhart, **Publisher** Tom Moloney

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YULETIDE INVADERS

NEXT MONTH

The world of electronic toys and games comes to *Computer & Video Games.*

Still in time for Christmas we'll be sifting through the latest bleeping, burping and talking creations which are chipping away at the established toy market.

For the chess enthusiasts amongst you, we'll have a rundown on the chess machines which are expected to sell this yuletide. From the expensive coffee-table versions, to the travelling companion sets, we'll find out the advantages these dedicated machines have over microcomputer chess programs.

And completing Santa's shopping list will be a pick of the software selection for TV Games Centres and the more popular computers.

This here's my newsagent



Me 'n my newsagent are real close. His name's Bill or Fred or something . . . Anyway we got an arrangement. Every month, you know what he does? He looks out my copy of *Computer & Video Games* and keeps it, just for me.

So none of the other punks on the street can get hold of my copy. And that's important to me. Mebbe it's important to you too. So go n' see your newsagent with that coupon below all filled out. If he's like Harry here, you're gonna like him.

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THE SHAPE OF THINGS . . .

NEXT MONTH

The more observant among you, may have noticed a few changes taking place among *C&VG*s more regular features.

The disappearance of Down to Basic is one example. In this issue you will find no Brainware as this has been replaced by our Puzzling pages. And other changes to the format are coming soon.

Down to Basic will be replaced next month by a column more suited to most home computer owners — and especially the games players. Machine code is already understood by many of *C&VG*s readers (especially the younger ones it seems) but for those of you who have not yet grasped the fundamentals we are starting up a column to help you get to grips with it.

The column is being written by Ted Ball and since we don't want to overload him too much, the December *Practical Programming* will be the last in the series.

Our machine code series will quickly be followed by an article showing you how to put your new-found knowledge to good use in setting up a wargame format, but more of that at a later date.

Kit Korner is also coming to the end of its run. And Keith Mott will be writing his last piece for us under that banner in this issue. Then he is being rested for December before returning in January with a projects page which will help you to get more out of your computer.

GAME WITH A DIFFERENCE

NEXT MONTH

The Seventh Empire was the rebel which challenged the stable rule of the known galaxy and set a pattern of warring confusion which holds sway to this day.

Piracy became commonplace, no planet was safe from the threat of invasion and whole star systems changed allegiance as the tribes fought for the raw materials on which galatic fortunes rested.

The Seventh Empire is the name of a computer game so different it will take us three issues to get it started. December sets the scene of the game which can even be played by those without a home computer.

STAR GUARD FOR GRANNY!

NEXT MONTH

Star Guard sets you the task of preserving fuel pods from a fleet of attacking aliens.

Granny is probably not in the best of taste but its heart is in the right place so we published it anyway.

MARK GETS HIS PRIZE

Winner of our Beat-the-Bugs Competition, Mark Williams from Sutton Coldfield in Birmingham came down to visit us and collect his BBC Model B machine.

Mark was also given a selection of Acornsoft cassettes to go with his machine — courtesy of Small Enterprises and Acorn.

But his success did not stop here, for a local businessman, who heard of Mark's programming expertise has asked him to help set up a microcomputer system for his insurance broker firm.


IF THE CLOUDHOPPERS, WASPS, SPIDERS, METEORS, OR SATELLITES DON'T BEAT YOU...
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satellites and meteorites



Please drop us a line at: Computer and Video Games, EMAP, Durrant House, 8 Herbal Hill, London EC1R 5JB.

SPOT THE BODGE!

Dear Sir,
After unscrambling your Mini Defender program for the 1K ZX81 — talk about spot-the-bodge, huh! I found that the game itself was very enjoyable and interesting and I must hasten to add that the unscrambling bit was fun — GREAT FUN!

My high score was 535 and this was obtained after changing the loop in 'E' (line 70 — yes the one that looked like you had a rush of M/C to the brain: '(QINKEYS' — I ask you) to FOR E = 9 TO 1 so that another 'group of aliens' — denoted by a "?" — attack before the loop ends.

Then I proceeded to add a flagship (OU — so it was an inverse 'less-than' sign) which looked real menacing — honest! I was scared — petrified! This gave a random score between 0 and 36 by using LET S = S + (10−E) * (INT(RND*5)) * (B$(E) < > (8(and pushed my final highest score to 822 — yes 822 — let's see someone beat that then!

Phillip Hall,
Hinkley,
Leicestershire.

FRUSTRATED OWNER

Dear Sir,
Thank you for a very good and interesting magazine, it has been a great help to me and my programming over the past month.

However, I own a TRS-80 colour computer and being a video game fanatic, I am getting very frustrated. I don't expect a program listing in your magazine every month as I do understand that the TRS-80 colour computer does not seem to be very popular, but a mention in your September Graphics feature would have been pleasing.

I cannot understand why the computer does not seem very popular with established TRS-80 model 1 and 3 software producers, I am finding it very difficult to get new software.

However, I would like to pass on a bit of information, if I may, to other users. I have been in contact with Microdeal of Bodmin, Cornwall, and found that they have a lot of imported products for the colour computer. So there seems to be a ray of hope there!

Mr A.E. Mann,
Boston,
Lincolnshire.

VIEWS ON MICROVADERS

Dear Sir,
In response to your request for comments on the Microvaders program in the July issue. Here are mine:-

1. Having the machine code in separate REM's and putting it up to the top of the memory is a big advantage over putting it on top of a REM full of Ø's.
2. Unfortunately I found that the M/C program to move it up in the memory didn't work. So I wrote a basic program to do this for me but it takes about 50 seconds.
3. The M/C program in line one as printed is very ambiguous, as the question mark can mean many things.

I enjoyed playing the game with my home-made joystick. I am looking forward to more M/C programs in *Computer and Video Games.*

Adrian Ellis
Worsley,
Manchester.

DISC DRIVE DOUBLE . . .

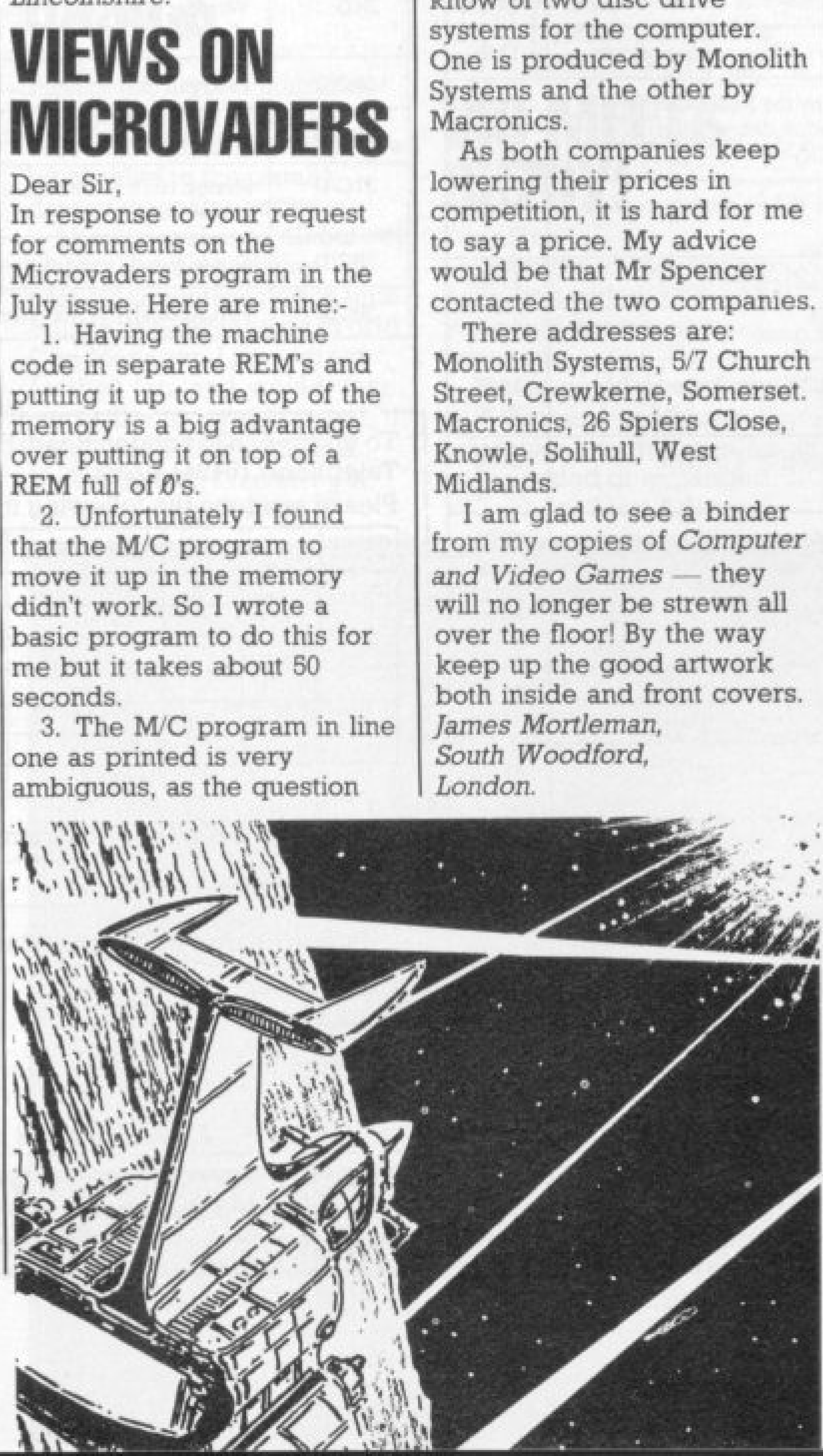
Dear Sir,
Your reply to Mr Spencer in the September issue stated that there were no disc drives available for the Sinclair ZX81. At present I know of two disc drive systems for the computer. One is produced by Monolith Systems and the other by Macronics.

As both companies keep lowering their prices in competition, it is hard for me to say a price. My advice would be that Mr Spencer contacted the two companies.

There addresses are:
Monolith Systems, 5/7 Church Street, Crewkerne, Somerset.
Macronics, 26 Spiers Close, Knowle, Solihull, West Midlands.

I am glad to see a binder from my copies of *Computer and Video Games* — they will no longer be strewn all over the floor! By the way keep up the good artwork both inside and front covers.

James Mortleman,
South Woodford,
London.



SOME ALIEN BUG TROUBLE

Dear Sir,
Thank you for the amendment sheet concerning the Microvaders program from your July Z-Extra supplement. Unfortunately, this was not enough to make the program work.

I wrote to Microx requesting an original listing. I received prompt attention, a listing and the answer to my problem.

Mr P.W. Norris of Microx pointed out that in line 18 of the program the 10th character from the end of the line is a 'B' and not an '8', which is almost unbelievable when looking at the listings.

I wish to express my thanks to both your magazine and to Microx, for your attention, to which end I hope you publish this letter.

Mr C. Brooks,
Cheltenham,
Gloucestershire.

DISCOVERING TEXAS . . .

Dear Sir,
I bought your magazine for the first time in September and I was quite startled to find so many programs in your magazine for only 75p!

I recently bought my son a Texas Instruments computer and I am looking for game programs for him to occupy himself with. I looked through your magazine and did not find any TI programs. After all the TI is a good computer so why is your magazine neglecting this well developed piece of machinery?

P. Evans,
Great Yarmouth,
Norfolk.

Editor's reply: Our magazine is now on the TI bandwagon Mr Evans, there is Space Laser in this issue.

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MAILBAG



PLAYING THE MICRO GAME

Dear Sir,
Thank you for a marvellous and good value for money magazine which I have read from issue one. I particularly like Video Screens and Arcade Action.

Being a newcomer to the micro scene I would be grateful if you could help me over the problem of which micro to buy.

My main reason for wanting a micro is for playing good quality games and high resolution graphics are important to me. My price boundary is about £200. Can computers at this price play games up to the standard of Mattel's Intellivision?

Finally, having owned an Intellivision for quite some time now, I would be grateful if you could update me of any new developments to do with Mattel's computer.

David Liddle,
Hexham,
Northumberland.

Editor's reply: To answer your last question first David, the standard of software for most of the popular home computers is as high as Intellivision games.

Sound and good quality graphics are available from several machines under your £200 ceiling. The VIC-20, Spectrum, Atari 400, T.I.99/4a and the Dragon may all be worthy of your attention. For further details on what these machines are capable of read our Buyers Guide on page 86.

FROM THE SHARP END

Dear Sir,
I have recently acquired the use of a Sharp MZ-80K computer. Unfortunately however my programming knowledge is limited and I cannot yet make my own good games listings.

Your magazine was recommended to me by a friend as having many listings for the MZ-80K, but I have found to my disappointment that you do not.

Please print some interesting, exciting and adventurous programs for my computer. You often do a Sinclair Selection so why not do this for other computers. I know several programmers in my area who would also appreciate more Sharp programs.

John King,
Cheadle Hulme,
Cheshire.

Editor's reply: Hardly fair criticism John. The Sharp has frequently been the computer to feature our "star" games. Ideally we would like to have several programs for each computer, each month, but space restrictions make this impossible. The Sinclair Selection you mention, consisted of only 1K programs which would be a waste on the Sharp's large memory capacity.

BACK TO BASICS

Dear Sir,
First of all, a great magazine! Glad to see that there is a colourful magazine bringing a bit of relief to the usually dreary magazine racks.

I have purchased all but two of your issues, and was particularly interested in June edition which featured World Cup Manager. I am a great football fan, and would very much like to try this game, if only I had a Sharp MZ-80K. Unfortunately, I haven't got access to one of these machines, but am at present awaiting the delivery — seven weeks so far — of my 48K Sinclair Spectrum.

I have not yet been able to grasp the more difficult aspects of Basic programming. I attempted, however, to convert World Cup Manager game to run in Sinclair Basic, but I became stuck with a few things and was wondering if you could help me to convert such expressions as "Left $", "Right $", "Mid $", and "On I Goto . . .' into Spectrum Basic.

Please could you help by publishing those lines of the program concerned as I would dearly love to try the game on my Spectrum, when it arrives.

S. A. Wiltshire,
Peterborough,
Cambridgeshire.

Editor's reply:
LEFT $(a$,n) by a$(1 to n)
RIGHT $(a$,n) by a$(n to L)
where L= LENa$
and MID $(a$,nl,n2) by a$(nl to n2)
on I GOTO by
IF I = 1 THEN GOTO 100
IF I = 2 THEN GOTO 200

VIC MEETS BUZBY!

Dear Sir,
I am writing to your very good magazine with the hope that you could answer some questions.

Please could you tell me if any company produces adventure programmes for an unexpanded or expanded VIC-20, i.e. Scott Adams.

Also when I bought my computer a friend bought one at the same time — they are both VIC-20's. Is there any way that my VIC-20 and his Vic can swap programmes, communicate, etc. — over the telephone lines?

Richard T. Gilday,
Ramsgate,
Kent.

Editor's reply: Yes, Richard you can link up with your friend using the telephone lines. You need an IEEE488 capability and this can be provided by the appropriate interface, say VIC1112 at £44 from Commodore.

Commodore have published some software for PETS connected together and this can be adapted for the VICs. I suggest you contact them at their offices in Slough for programs. The address is 675 Ajax Avenue, Slough, Berkshire.

There are a variety of Scott Adams Adventure games which can be purchased from Commodore.

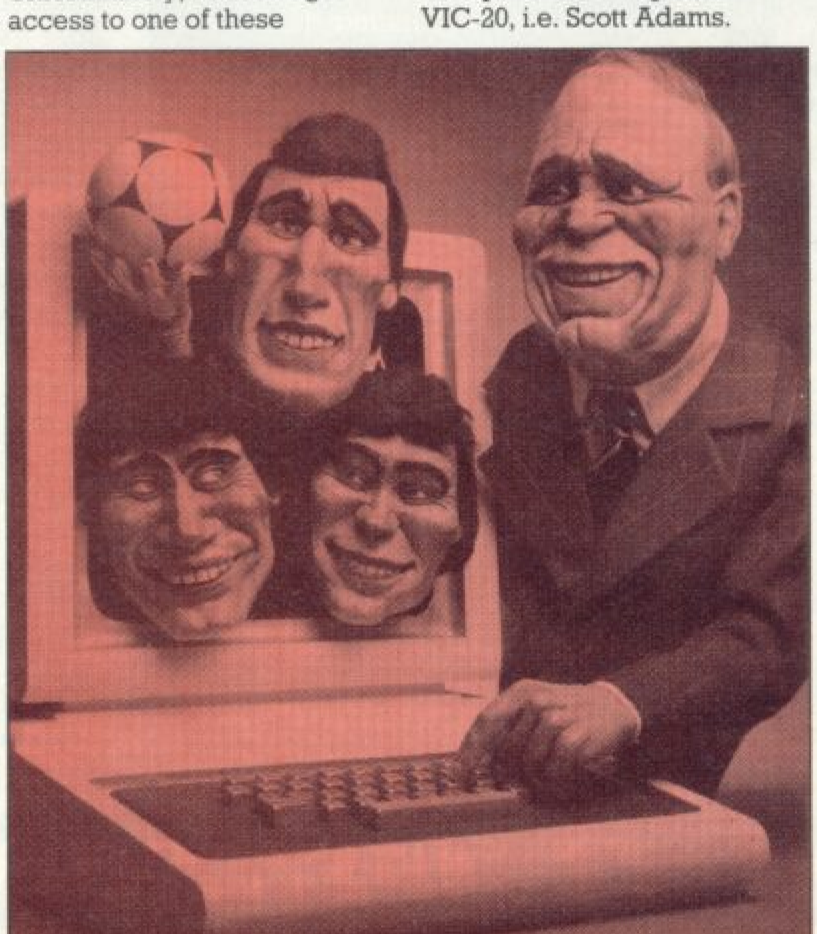
MORE FOR UK, OK?

Dear Sir,
Thank you very much for a brilliant magazine, it is the best money can buy. I have only one complaint. I have not seen any reviews of UK101 software, please could you publish one.

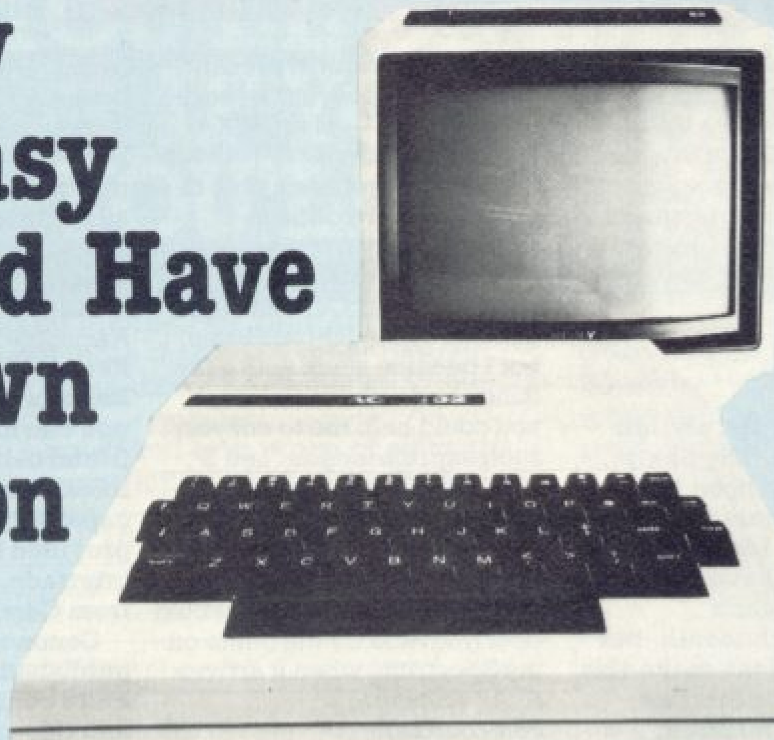
Being a UK101 owner, it is rather difficult for me to transpose programs from VIC, Atari, ZX81 and the like. I am sure many UK101 owners would love to see a program for their machine published in your magazine.

Bobby Lynas,
Margate,
Kent.

Editor's reply: There is not much games software around for the UK101 Bobby, but when we do get to hear of a new game, we will cover it in our Games News section. The UK101 has never really been seen as a games players' computer which probably accounts for this lack of software. But, space permitting, I will try to feature a UK101 game in the future.



Every Fantasy Should Have Its Own Dragon



In the realm of fantasy, one computer has to stand out. I refer of course to the Dragon 32 smoking away quietly in that dark corner.

A Dragon microcomputer will go to the winner of our fantasy ideas competition. So if you could find room in your house for a well-behaved Dragon then read on . . . or better still read the feature on page 24 first.

If you've digested the tips on building your own computer fantasy game we now want you to dig deep into your imagination and come up with just such a game.

You can either go back in history (or even pre-history) to set your game against a backdrop, like Gladiator. Or you can go forward into a distant future.

But fantasy should put no holds or bars on your imagination and perhaps you would like to set this particular adventure in a time that never was.

Your entry should include:

- The idea: not just a title but a description of how you think the game would work and how it would be operated.
- The algorithms: the basic functions which would form the core of the program and determine the outcome of conflicts.
- Practicality: a paragraph outlining why you think the game would be commercially viable.

The entries should be sent to: Fantasy Competition, Computer & Video Games, Durrant House, 8 Herbal hill, London EC1R 5JB and reach us before 16 November 1982.

They will be judged by Mitre Wargames, whose Mark Blundell wrote the article on building a fantasy game and if they are sufficiently impressed, Mitre have undertaken to try and turn the winning entry into a computer moderated game and invite the prizewinner to help produce and market it on a royalties basis.

Employees of EMAP, Dragon Data and Mitre Wargames and their relatives may not enter the competition. The judge's decision is final and no correspondence will be entered into.

The Welsh Dragon has made a fiery entrance to the microcomputer market.

Styling itself the "family" microcomputer, it is selling well at its £199 price tag and looks set for a good Christmas.

The winner of our Fantasy Game Competition will have a Dragon on his hearth complete with 32K of memory and a screen size of 16 lines by 32 characters.

It plugs into the common domestic television and uses a household cassette recorder to save and load programs.

It already has several fantasy adventures in its software range and with independent software houses now producing games cassettes for it, the machine should soon have a comprehensive library of games software behind it.

So no dragon feet, get those imaginations working overtime and those entries off quickly.

BRAINWARE

The answers to last month's Mind Routine are:

1. Maximum product of node sums = 34012224
2. Minimum product of node sums = 25625600
3. Maximum sum of node products = 2925
4. Minimum sum of node products = 1212

The solution to October's Nevera Crossword is printed right.



Confessions of a Bug

There's nothing we Bugs like better than a good Atari program to get our teeth into.

T. Hitch has run up an Atari bugging routine so sophisticated and subtle that it defies solution.

Take Wild Strawberries for example: never in the history of this magazine has a readership been so split over a program. Half of them seem completely unable to get the game running no matter what. The other half are phoning up to congratulate *C&VG* on producing such a good Atari game which runs first time on being entered. Even better, the ones who have problems all claim a different line as being the culprit.

You should see the poor editor tearing his hair out trying to understand what's going on. The only piece of advice he can offer is to check all the 0 and Os in the program carefully.

Vic owners may have had some difficulty with Brick Blaster as the cursor control symbols have printed up badly. If you have had problems with this game please ring or write for a correction sheet.

ANSWERS



PINBALL PATIENCE

If you have entered our Pinball Competition please be patient as these have to go to America to be judged by the Bally Pinball Division.

They will be back to us soon to give us their nomination for the lucky winner, who is due to receive a Bally Electra Pintable in his front room.

And hopefully find that Bally have taken his design ideas and incorporated them into the sort of pinball machine he would like to play.

But a special thanks from me to all the many people who put so much effort into the competition.

We were overwhelmed by the standard of the response and the carefully constructed and detailed diagrams which accompanied the ideas.

The Sinclair game idea competition has been whittled down to the top 20 ideas.

These are currently with software house Psion, whose top game designers will be trying to pick an overall winner from here.

● The winners of our September Brainware Competition are: A Crowhurst of Drakes Way, Mariners Park, Portishead in Bristol — who won the Nevera Crossword — and Richard Parkin of Northwich Road, Weaverham, Cheshire who was first out of the hat with our Mind Routines answer correct. Champagne is on its way to both.

OUTER SPACE ARTHUR NEGUS'S

Collecting on a galactic scale, is the task of the Itemizer race.

These outer-space Arthur Neguses are controlled by Dean Goodman and are currently engaged in notching up points in the *C&VG* game of Starweb.

Dean's Itemizers are currently up to their short green necks in intrigue and tactical thinking so convoluted as to make the valuing of a early Chippendale seem pedestrian in comparison.

So on with the antiques space highway show . . .

As the richest person in the solar system, Itemizer the artifact collector becomes monumentally excited by the idea of owning unique things.

On many of the worlds in the system there are various indestructible artifacts left behind by a now extinct race of beings.

Despite his passive nature, Itemizer will do almost anything to possess these objects, although aggression is not his strongest point.

On one occasion, driven by greed, he attacked a foreign fleet but now regrets that action as it appears to have been a tactical mistake. Overwhelming reinforcements arrived the following turn calling for a quick exit by the home fleet.

Tactics have to be adapted as other game characters reveal themselves. Because each player needs different things and because each player acts in different ways, some middle ground usually exists for negotiations and barter. Successful negotiation has so far proved difficult however.

Two fleet controllers disappeared before contact had been cemented (leaving populations converted to religious extremism), and another controller destroyed the fleet sent to establish contact!

At the highest level it is important to have an overall strategy and to keep to it. Itemizer keeps his forces and artifacts close to his homeworld and avoids spreading fleets thinly. Unprotected worlds are weaknesses and the empire could become vulnerable as a result.

So what orders will be sent-in next turn? The empire's centre line is under threat from a Pirate and as the extreme right flank has proved unprotective, a shift of two fleets from the right to help reinforce will be necessary. Probing fleets will be sent to explore three worlds on the left flank in the hope that more artifacts will be found.

If you get an opportunity to take in a computer-moderated game such as Starweb, jump to it. Intelligent gaming is both mentally stimulating and intensely enjoyable, despite the lengthy turn-around time (four weeks).

PUZZLING SOLUTIONS

Puzzling solution? Well they will be if you haven't yet found our sparkling new page of brain-teasers.

Turn to pages 72 and 73 to test out your mind, or, perhaps, your computer, before reading any further.

SWORD OR WORDS?

1. Hornet
2. Rotund
3. Batman
4. Minuet
5. Sprout
6. Escort
7. Pistol
8. Sparta
9. Sister
10. Raffia
11. Abroad
12. Entrap

COMING AND GOING

	CAR	APPROACH	EXIT
Miss Ellis	Rolls	Copper	Silver
Mr Price	Maxi	Brass	Gold
Mrs Downs	Van	Gold	Lead
Mr Lucas	Mini	Lead	Brass
Mr Turner	Estate	Silver	Copper

So Mrs Downs has some questions to answer as to what is in her van.

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22 Silver Serpents @ 15p = £3.30
17 Thunder-Claps @ 4p = 68p
Total £5

The solutions of the Mastermind competition have been held over until next month.

This will give you all a chance to test your logic circuits and see if you can come up with the four answers, unaided.

If you do, then please rush in an entry to us at: Puzzling, *Computer & Video Games*, Durrant House, Herbal Hill, London EC1.

And you could win an Invicta Electronic Mastermind to practise on.

spectrum

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Offers extended until 15.11.82 & apply to featured free offers only.

See next page

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.

GAMES NEWS

SOMETHING FISHY IS GOING ON . . .

FISHING, ROULETTE

Angling is one of the most popular pastimes in this country. Now you can take up fishing without having to sit in the rain for hours, thanks to Calisto Software.

Cast your rod into the sea at the end of the pier and see how many fish you can catch on the end of your hook.

This is the simple aim of the computerised angler in Fishing — the latest game for the ZX81 from Calisto.

Side two of this cassette features a computer version of the popular casino game Roulette. The wheel is displayed on the screen — though it does not spin.

Instead the ball moves around the wheel stopping at random on one of the numbers on the wheel's perimeter.

Each player is given £1,000 to start — the game then being played according to the normal rules of Roulette. The game allows up to four people to gamble.

Roulette and Fishing are available from Harrogate based Calisto Software, at £2.50 including postage and packing.

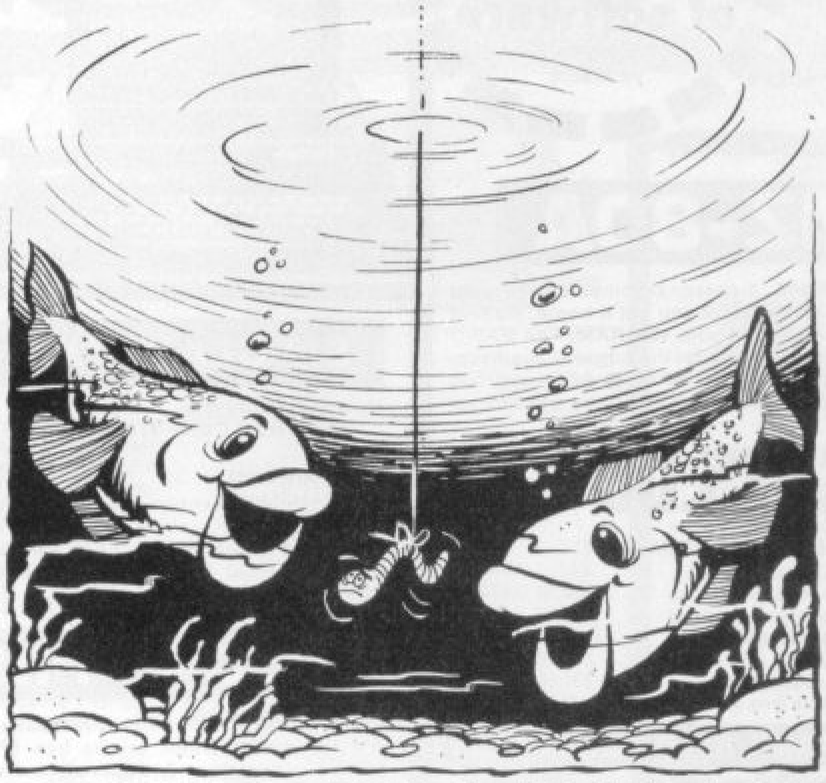




Illustration: Terry Rogers

BEWARE THE BUNKERS!

TX3 GOLF

Score a hole in one without leaving your armchair in this latest computerised golf game.

This one features authentic golf course obstacles such as bunkers, trees, and of course the dreaded "rough". The course itself is represented on the screen in 3D and is randomly selected.

TX3 Golf is one of a new range of cassette-based games for the Texas Instruments 99/4a. Others in this range feature a version of the popular arcade game Battlezone, a chess program, and Four-in-a-Row, a computer version of the Connect Four game in which you must join up four counters in a faster time than your opponent.

The games are available from TX Software of Harlow, Essex at £5.00 inclusive.

THESE FINANCIAL TIMES

AIRLINE, AUTOCHEF, PRINT SHOP

Move over Freddy Laker, Charles Forte, and Rupert Murdoch as computer buffs enter the world of high finance in three new business simulations which recreate the world of airlines, printing, and hotel management.

Airline offers you the chance to play Freddy Laker for an afternoon as you decide the number of aircraft to operate, whether to buy or charter, whether to enter into a loan or a fuel contract and the levels of staffing and maintenance.

As if this were not enough to worry the would-be international airline tycoon there are also tax demands, strikes, cancelled flights, hijacks, and crashes to be taken into consideration.

Autochef casts you as the managing director of a catering company. The forward purchasing of foodstuffs and wines must be carefully considered involving the exchange of vast sums of money. And you'd better make the right decisions for there is an angry organised group of shareholders itching to oust you from the managing director's office.

Print Shop is the last of these three business game programs. In it you have to decide the number of staff to employ, the amount of money to be tied up in paper, and the type of paper to be purchased.

Airline, Autochef, and Print Shop run on a ZX81 in 16K or on a Sinclair Spectrum. The games cost £4.75 each or £12 for three and can be obtained from London-based Case Computer Simulations.

BATTLE FOR THE MOONS OF JUPITER

MOONBASE 10

Join in the fierce battle for the moons of Jupiter! The battles are based on three well known Atari arcade games.

The game has seven different skill levels which effect the distance you have to travel to reach the moons and the speed of the approaches.

The aliens you have to do battle with in this game are alien attack ships which are worth 100 points.

Space mines are only worth 10 points but you must be careful not to crash into them as this can end you the game.

For each 1,000 points you score you will receive a reserve ship.

These are carried over from battle to battle, and appear just to the right of the score during the battle.

There are also invisible alien scout ships to contend with and if you survive the preliminary onslaughts there is ultimately the alien robot commander to be dealt with.

One interesting feature of this game is the accompanying sound commentary.

This comes on cassette with the programme and consists of side A which is a long narration to be used with the game the first time it is played and side B which is considerably shorter to be used thereafter.

Moonbase IO runs on an Atari 400 or 800 from cassette or disc and is available from West Midlands based Softcell. At £24.95.

Also new from Softcell this month is an adventure game in which you play the part of a ghost.

This ghost has the haunting task of seeking out treasure.

This treasure is hidden in 30 rooms of a haunted house — so only ghosts with high spirits need apply!

This is a real time game played using a joystick.

It costs £19.95 and runs on Atari 400 and 800.

GAMES NEWS

THERE IT WAS, IN THE NET!

SOCCER



Can't kick a ball to save your life? Never mind — you can still score the winner for your favourite team with a little imagination and this latest soccer simulation game.

Using a joystick you can move your player forward bringing the ball into your opponents half. Shoot by depressing the fire button on the joystick.

To tackle you simply place yourself in the front of your opponent, or intercept passes — just as in a real game.

The game features a rolling display of football field, including goals, line-markings, a clock to keep the time, and 22 players in black and white strip.

You can play against a friend, or take on the computer.

You can also team up with a friend to tackle the computer's squad — just in case it proves to be a tough opponent!

Soccer runs on Atari 400 or an 800 and is one of a new range of games from Thorn EMI, the giant electronics company, who have now entered the microcomputer software field.

Soccer is just one of nineteen games that Thorn EMI are producing for the Atari 400 and 800.

There are also two programs available for the Commodore VIC 20 — River Rescue and Vic Music Composer.

The Thorn EMI range will be widely available in the months leading up to Christmas.

MONSTERS, ELVES AND TREASURES

XANADU ADVENTURE

A new two player adventure game is the latest novel idea for the BBC machine.

It's based on the well-known fantasy role-playing game Dungeons and Dragons and includes many of the features Dungeon fans will have come to expect in a good underground adventure.

Just like the "real-life" version there are nasties down in them there dungeons.

In this version you can choose to team up with your companion to do battle with the evil assortment of elves, dwarfs and monsters that attempt to thwart you in your bid to win the treasure and escape from the caves.

You can also choose to play against another person — attempting to beat him to the glittering prizes hidden in the dank, dark caves.

Xanadu Adventure is available from Berkshire based Hopesoft at £7.75 inclusive.

STARSCRAMBLE

OMEGA MISSION

Omega Mission places you at the controls of a Starfighter thundering through space at breakneck speed.

Your mission is to destroy four waves of attacking aliens which fly at you from right to left as you navigate your ship over rocky mountain terrain, through tunnels and caves.

The first attack wave is a barrage of ground to air missiles which fly straight up towards you from the planet's surface. If you survive the missiles you fly into a cave where a storm of fireballs fly at you at great speed.

You cannot shoot these fireballs so the key to survival at this stage is to dodge.

The third stage features the alien craft themselves, followed by swarming mutants. The final test is a test of flying skill as you navigate a narrow tunnel to complete the Omega Mission.

After each mission you receive a bonus score and are then sent out on a new harder mission. The game features colour graphics and has sound effects. It also records the high score and name of player.

Omega Mission is based on the popular arcade game Scramble and is one of a new range of games which are based on arcade favourites from Epsom based Micromania. The game runs on a 12K Acorn Atom and costs £7 inclusive.

Also featured in this range of games are versions of Defender, Puckman, Centipede, and Missile Command.

TOUCHDOWN AMONG THE ZOMBIES . . .

MOONLANDER

Moonlander challenges you to land your craft on the uncertain terrain of an inhospitable planet.

Points are scored by successfully touching down — higher points being earned for landing on the narrow plateaux.

This version of Moonlander runs on a BBC Model B and is available from East-London based Software For All at £6.45 plus £1 postage and packing.

Another new BBC game from the same stable features a version of the well known computer game Zombies.

In Zombie Island you are chased around your island by a nasty bunch of Zombies. Your only escape is to make them fall into the numerous potholes that litter the island.

Row of Four is a computer version of the popular Connect Four game in which you have to make a straight line of four counters before your opponent can. In this case your opponent is the BBC Model B — and a very canny opponent too.

Row of Four and Zombie Island run on the BBC Model B. Both games cost £6.45 plus £1 postage and packing.



Illustrations: Terry Rogers

NEW PRODUCTS NEW PRODUCTS NEW PRODUCT

GAMES NEWS

SINISTER SERPENTS SLITHER IN

SERPENTINE

Snakes have taken over planet Earth! Your mission is to make the planet safe again for human habitation.

You control a good snake who chases the evil snakes through a randomly created maze.

In order to eat the evil snakes you must first become larger than they are. To do this you gobble up all the eggs which have been layed by the nasty serpents.

You can also grow fat on the occasional frog which hops about the screen. There is another good reason why you should eat the frogs — they also eat the eggs in the maze thus depriving you of the essential nourishment which will enable you to grow large enough to take on the other snakes.

If you cannot out-grow your opponents there is another way to tackle the surly serpents. Sneak up behind them and nibble at their tails!

Serpentine is the latest game from South Croydon based Spider Software for the Apple 48K. The game comes on disc at £19.95.

JAWS WITH BITE!

SHARK ATTACK

You are thrown to the sharks by a bunch of bloodthirsty pirates short on a bit of mid-ocean entertainment.

To give you a sporting chance of survival they provide you with an automatic net with which you must cover the visible ocean surface in an attempt to trap the sharks.

As if sharks were not enough to worry about there are also a number of giant octopi swimming about on the look-out for food. These sometimes provide a diversion for the sharks who will bite clean through one if it crosses their path.

Shark Attack is one of a new range of games for the VIC-20 from Slough-based Romik Software.

Also new on the bright yellow Romik label this month is a Scramble-type game entitled Martian Raider and a Multisound Synthesizer which turns your VIC into a music centre.

All three games run on the unexpanded VIC and cost £9.99 each.

You'll be able to play anything from space themes to the latest pop hits with a little practice!



ILLUMINATING EXPERIENCE IN A MAZE

SPECTORS

You'll be fumbling around in the dark in this latest — but novel — twist in the maze game theme.

Your little man must illuminate the pitch black maze with light bulbs. He is pursued by ghosts who chase him through the maze. There are also a number of generators dotted around the maze which, when your little man touches them, turn on the light bulbs and enable him to eat the ghosts for a few seconds.

A new maze is presented when the current one has been completely filled with light bulbs.

Spectrum Spectors is the latest game from Liverpool based Bug-Byte for the Sinclair Spectrum, and it costs £5.00 inclusive.

DOWNPOUR OF AN ALIEN KIND

CLOUDBURST

Watch out for aliens jumping out of the clouds for they are not as friendly as they look.

Their aim is to colonise our planet, enslave its inhabitants, and savagely stamp out all resistance.

You must kill the evil little beasts before they land. In order to do this you will need a swift finger on the fire button, an accurate shot, and skilful manipulation of your gun — which is dome-mounted and can move through 45 degrees.

This facility is essential to your planets survival as you need to be able to shoot sideways as well as upwards to kill the aliens that have already landed and are making towards you.

During their stealthy approach the aliens contaminated some of the rain clouds causing them to discharge intermittent downpours of radio-active rain.

They also brought with them an assortment of man eating spiders and giant insects.

This game may well remind the player of that ancient intergalactic proverb: "All that jumps from the clouds may not be a cute little alien with a big smile on his face".

Cloudburst is one of the new range of games from Audigenic for the VIC-20. The game comes on cartridge and plugs into the back of your Vic. It is available from the Reading based firm at £19.99.



VIDEO SCREEN

FIGHTING THE EVIL ZYLONS

STAR RAIDERS

Star Raiders puts you at the controls of an Atari Federation Starship hurtling through space at twice the speed of light.

The view from the cockpit is of deepest space with asteroids and stars streaking past you, in this version of the popular Atari computer game.

Your mission is to destroy all Zylon warships on sight.

Zylon fighters and cruisers can be destroyed by your photon torpedoes once they fly into your screen mounted sights.

But once you have shot down the defending star-fighters your mission becomes slightly more difficult.

You must destroy the Zylon headquarters. This is called the Basestar — and is well protected from attacking forces.

The Basestar is a little more difficult to destroy as it is protected by shields forcing you to risk the lives of your crew in an attempt to fly in and attack at close range.

The Starship is equipped with a number of sophisticated flight and battle information controls. The attack computer display shows you the position of the advancing enemy fleet.

The computer also keeps a running total of the number of Zylons downed — and those remaining.

Damage control informs you on the state of your own craft and the amount of energy you have left to carry on your attack on the enemy fleet.

The attack computer controls the sights — glowing red when a photon torpedo is trained accurately on an enemy target.

The game features a number of difficulty levels and a sophisticated scoring system which is based on the remaining energy when you have successfully destroyed all the Zylon invaders.

Star Raiders runs on an Atari VCS and will be in the shops from November at £29.95.



Illustration: Jon Davis

STOP THE ATOM PLANT GROWING

REACTOR, AMIDAR

Atari owners can look forward to three new titles in the new year from Parker Video Games — the manufacturers of Frogger and The Empire Strikes Back.

Reactor traps you inside a nuclear reactor. Your mission is to stop the core from expanding which, if it gets much larger, will explode — spelling doomsday for millions of people. You can only stop this by blasting the control rods with nuclear particles causing the ever expanding core to shrink.

Amidar is based on the popular arcade game of the same name. It is a simple task of collecting coconuts and painting lines. But watch out for the patrol guards — if you get boxed in you'll have to use your jump button to escape.

Super Cobra is a graphically impressive version of the chopper attack game in which you must destroy the enemy base. You fly through a maze bombing the fuel dumps.

If you get beyond this stage then you will have to shoot it out with the UFOs that spiral towards you — moving at great speed from left to right across the screen.

The games will be in the shops from the end of January, priced at £29.95.

MARCH OF THE DEADLY DEMONS . . .

DEMONS TO DIAMONDS

Demons to Diamonds challenges you to shoot down an army of trog-like demons who are marching towards you in this latest shooting gallery simulation game for the Atari VCS.

One or two players can play the game at the same time using Atari paddles to control your gun base.

Each player has to shoot only at a certain colour demons. If you accidentally hit one of your opponent's demons the little chap turns into a skull and starts taking pot shots at you.

When you hit one of your own demons it turns into a diamond and bounces from left to right across the screen advancing towards you before suddenly disappearing. Diamonds are worth extra bonus points if you can shoot one.

If you manage to shoot down eight screens the shooting skulls will begin to appear at random. After the tenth screen they begin to move, becoming more difficult to hit and getting faster with each screen.

Demons to Diamonds is due for release in October and will be one of the less expensive new games this Christmas at £18.95.

SHARKS WITH A BITE

NEW FROM APOLLO

The range of games now available for the Atari VCS is about to be widened still further with six new titles from America by Apollo.

Apollo will be the fourth independent company selling games in the UK for the Atari VCS.

Space Cavern challenges you to explore a cave on a planet lost in space time.

Space Chase is the classic galactic battle where you shoot down rows of alien space craft.

Shark Attack is Apollo's answer to Pacman. In this development of the maze theme you control a diver who swims along collecting diamonds.

There is also a two player squash game called Skeet Run in which you shoot clay pigeons on your TV set.

The Apollo range of games are distributed by Vulcan Electronics.

The games cost £24.95 except for Skeet Run which is a little cheaper at £19.95.



FIND THE ULTIMATE ANSWER . . .

RIDDLE OF THE SPHINX

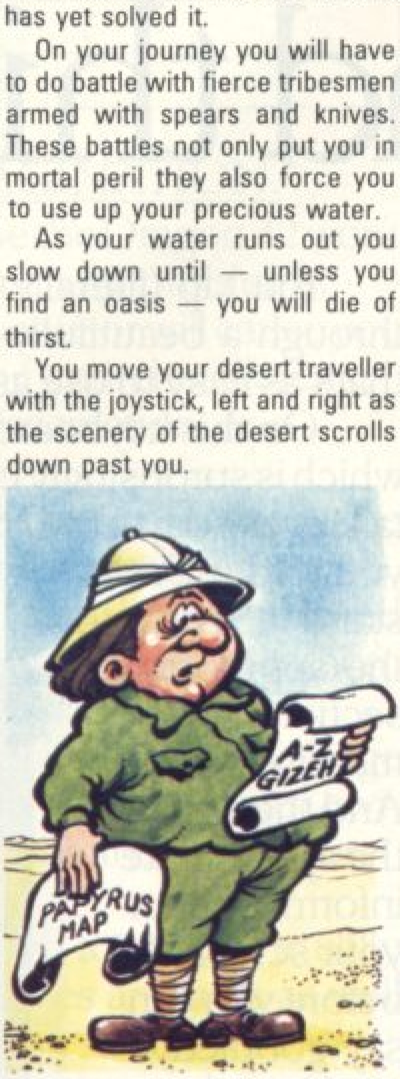
Riddle of the Sphinx offers you a unique video games challenge, combining an adventure format puzzle with a reaction firing test.

If you discover the meaning of the riddle you could be the first person to do so. Although it has been released in the U.S. no-one has yet solved it.

On your journey you will have to do battle with fierce tribesmen armed with spears and knives. These battles not only put you in mortal peril they also force you to use up your precious water.

As your water runs out you slow down until — unless you find an oasis — you will die of thirst.

You move your desert traveller with the joystick, left and right as the scenery of the desert scrolls down past you.



The aim of the game is to collect as many diamonds and caskets of treasure as you pursue your apparently nomadic trail through the desert in the ultimate pursuit of the answer to the Riddle of the Sphinx.

You also encounter some good characters on your journey — among them a beautiful maiden.

Can this be a clue to the Riddle of the Sphinx? The game is one of the Imagic range, distributed in the UK by Adam Imports and will be in the shops before Christmas at £27.95. It runs on an Atari VCS.



Illustrations: Terry Rogers

BECOME A WHIRLYBIRD WIZARD!

CHOPPER COMMAND

Chopper Command is the latest addition to the Activision range imported into this country by Computer Games Limited.

The game is well known in the States where the manufacturers took out whole pages in games magazines to advertise the cassette.

The basic task is to defend a convoy of medical supplies as they journey through the desert.

On your journey you are attacked by enemy jet fighters and guided missiles.

You have the aid of radar which represents the oncoming aircraft as a series of white dots on the horizon and you are a black dot.

You must constantly keep an eye on the radar so that you are well positioned to pick off the enemy aircraft before they can penetrate your defences and get at those vital medical supplies.

Chopper Command has impressive graphics, the desert being represented as deep glowing orange.

The chopper itself is a detailed simulation in yellow with the trucks black silhouettes.

Chopper Command runs on an Atair V.C.S. and will be in the shops at £24.95 in late October.

DICE CALL THE TUNE

BACKGAMMON, DRAUGHTS

Backgammon and Draughts are the two new titles offered in time for Christmas for the Voltmace Database TV games centre.

The Backgammon cassette features a number of games at different levels of difficulty. The first teaches you how to play the game in easy to understand stages.

The dice are rolled automatically by the machine and change colour from blue to red to indicate which player's turn it is — or to indicate that it is the computers turn if you are playing alone.

The Draughts cassette also features several different versions.

You can play against a friend or take on the computer at one of three different skill levels.

For people who like to do things backwards the game will also allow you to play a reverse version of draughts in which the idea of the game is to get rid of all your men before your opponent.

Backgammon and Draughts will be available at Database dealers from October at £19.95 each.

DEALING WITH DEADLY DISCS

NEW FROM INTELLIVISION

Mattel are about to attack the Christmas TV games centre market with a number of new releases for the Intellivision machine.

The long awaited Tron games — featured in **Computer and Video Games** last month — Deadly Discs and Tron Maze-a-Tron are due in the shops in October.

In Deadly Discs you do battle with a variety of computer controlled adversaries — armed only with an electronic frisbee.

In Maze-A-Tron you have to penetrate the Master Control Program. But beware the nasty monsters sent out to thwart you.

Mattel are also offering a choice of two free games when you purchase an Intellivision machine. You can have a copy of Lock 'n' Chase — Mattel's answer to Pacman or their soccer simulation game.

Dungeons and Dragons will be in the shops from November and is a version of the popular role playing fantasy game in which you have to find your way around a maze of caverns and tunnels and win treasure.

Also new from Intellivision is card playing simulation on cassette. Royal Dealer offers a choice of four different games. You can choose to play against one, two, or three different computerised opponents. The game does not just display the different hands but actually shows you your opponents sitting around a table. The game also acts as a score keeper.

Intellivision cartridges can be obtained from your local Mattel dealer at between £19 and £24.

The new Dragon 32. So well designed, you'll even understand this ad.

If you're already a computer expert, may we refer you to the box of technical specifications displayed opposite.

If you're not, may we refer you to the new Dragon 32 Family Computer. A computer so easy to understand, you won't understand why all the others seem so difficult.

And the new Dragon 32 costs under £200.

32K RAM FOR UNDER £200?*

When you're comparing computers, the first thing you need to know is the size of the memory. In plain English, the Dragon has approximately 32 thousand units of Random Access Memory. (32K RAM for those who prefer to be blinded by science.) This means that the Dragon's memory is at least twice as powerful as its competitors'.

With a memory this powerful, the amount of information the Dragon can store is literally vast. But the Dragon doesn't just make it easy to store information. It makes it easy to use, too.

USER-FRIENDLY?

You may have heard of the term 'user-friendly.' Reverting to plain English once more, this means simply that the computer will go out of its way to understand you, rather than vice-versa.

The Dragon 32 is so user-friendly, it practically licks your hand.

You tap (literally) its vast resources through a beautifully-designed keyboard that's as easy to use as a typewriter.

On this keyboard, you type in a language which is surprisingly close to the English you talk every day. The Dragon 32 will receive your order. Understand it. Send it to the appropriate section of its massive brain. And then display the appropriate information on your screen. All before you can say 'gobbledy-gook'.



*TV not included in price.

It is ironic that one of mankind's most practical and logical 20th Century tools should provide so many opportunities for fantastic and historic escapism. Many computer games indulge us in our quests for myths and legends on exotic planets and more romantic eras. We asked Mark Blundell of computer moderated gaming company, Mitre Wargames, to explain how to map out computer controlled worlds and times as the fabric for a fantasy game.

BUILDING A COMPUTER WORLD

BY MARK BLUNDELL



Illustration: Jon Davis

A hot, dusty afternoon. The crowd was impatient, chanting and jeering, when suddenly there was hush: two tough, wiry figures strode into the arena, armed and ready for combat.

The tension broke, and wild cheers rang out — some for one, some for the other. Who will triumph in this deadly tussle of strength, wits and fortune? The Gladiator combat has begun . . .

You may remember reading about computer-moderated play-by-mail games in May's issue of *Computer & Video Games.*

A new addition to this field is Gladiator which is particularly close to our hearts, being not only British, but also entirely our own creation. I have set down here the background to the game, for those of you who are interested in play-by-mail (P.B.M.) games or who are thinking of creating one of your own.

One advantage of computer moderated games is that a large number of players can have their moves processed quickly and cheaply. It can also cater for complicated interaction between rival players without deluging them with extensive rules or requiring detailed analysis of a player's movements.

Lastly the computer acts as an unbiased and unmovable authority on the interpretation of the rules and how they are carried out. The biggest drawback is lack of flexibility as the programmer is unlikely to predict every possible development of the game he has created.

When we first developed Gladiator we tried to produce a game which made the most of the computer's strengths.

Having established the need for the game, we looked for a suitable subject, one which readily lent itself to computerisation. Many ideas were considered before we decided on the excitement of combat in the ancient arena as the ideal choice. In the system we have developed for Gladiator there are a limited number of variables, all interacting to produce results — the prime requisite for a computer-moderated game.

Gladiator meshes in very well with one of our existing games, The Tribes of Crane, so that players from there provide a basic nucleus for the game, giving a full number of gladiators eager for combat from the very start.

For a game set in the sword-to-sword combat of the arena, we clearly needed a blow-by-blow description of the fight and of the moments when the telling strokes were made. To generate this, we would need to input a number of variables supplied by the player, and let the computer "play" with them according to a suitable program to generate the result. Variables such as these are an essential ingredient of any computer-moderated game.

In the arena we decided that there would be three broad categories of variable: the ability of the gladiator; his tactics; and luck. We allocated these groupings to the three types of variable we wanted to input into the program.

First, there were variables which were constant for each individual gladiator in all of his flights: his experience, special skills, and so on.

Second, factors that varied for each gladiator, fight by fight — choices of tactics, special weapons or special plans. Finally, there are variables generated by the computer itself — the inevitable random element.

As all of our other games are role-playing games, where the player assumes the persona of a tribal chief or planet ruler, we naturally felt that the character of the Gladiator should be important. The whole of a player's first turn is spent in creating his fighter.

The player has a number of points which he can allocate to the various attributes of the warrior, like strength, speed and intelligence.

This choice is crucial as each attribute will have a different effect on each of the different kinds of stroke available to the gladiator in all his fights.

Tactics are devised by the player for each individual fight in which his gladiator participates. There are six basic strokes from which to choose,

and the wise gladiator will concentrate on those where his natural abilities are most powerful.

The opponent's previous fights will be studied, in order to plan the best tactics against him. 30 consecutive strokes are chosen on the turn sheet, and these are processed in order by the computer, simultaneously with the strokes of the opponent.

The gladiator's basic details — his main attributes and special abilities — are input when the gladiator is first set up, and stored on a floppy disc. Whenever a turn for that gladiator is processed, the tactics he has chosen are input and the attributes recalled from the disc.

These attributes are then used to modify the percentage chance of scoring a hit with the tactics chosen. This modification system is the core of the program. Graphs were drawn to show the shape of the effect which we wished each attribute to have as its strength (the points allocated to it by the player) varied; and then functions were devised to achieve the desired patterns.

The gladiator's attributes are compared with those of his opponent to determine the chance of hitting on any particular stroke for each gladiator. This involves cross-referencing the two strokes with each other, as there is a matrix for the chances which different strokes have against one another.

Random numbers are then generated by the computer and compared to the modified base percentage chance of a hit to see if one has actually been achieved. This is the luck element.

If you decide to devise your own game, the functions and algorithms which are the core of any game program, should have considerable thought devoted to them.

The way in which you want each variable to affect the result is crucial. I have shown some examples of functions (above) but there are obviously many others, as well as other variations of these, which can be devised to give an infinite range of effects. You may need to talk to a friendly mathematician to turn the graph or diagram into an algorithm the computer can use.

One last important consideration is the gradient or slope of these functions. These will determine precisely how much each change in value of the variable alters the effect it has on the result. These are crucial to play-balance and the only way to achieve a good balance is through rigorous play-testing.

It may sound dry stuff but this is the crux of the game and the most exciting part of seeing your creation come to life is seeing how the algorithms respond to a set of circumstances and then tuning them to achieve believable results.

Don't make the mistake of choosing an all-powerful tactic which will win no matter what, players will quickly find it. Instead produce a matrix where the tactics entered by either side are compared and the results taken into account when finalising the outcome.

A simple matrix of the sort used in World Cup Manager *(C&VG June)* is also illustrated above.

To add to the personality and excitment of the game various wrinkles and tweaks should be added to the basic algorithms. In Gladiator, for example, the combatants may elect to begin with a spear cast before closing in or can fight to the death instead of just until first blood is drawn.

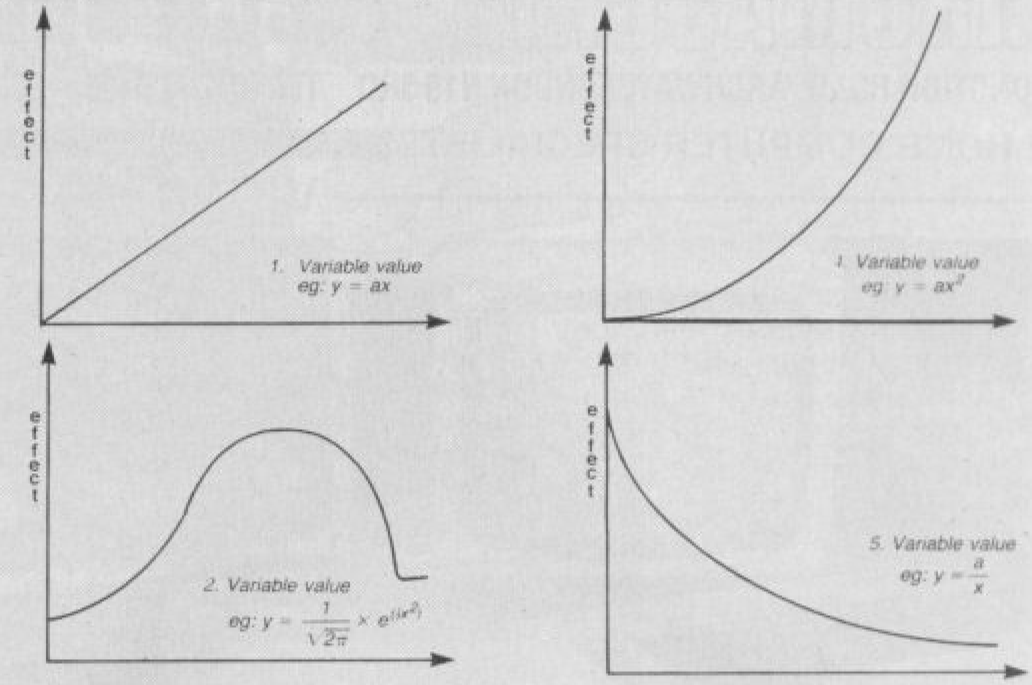
In the army chieftain type of P.B.M. it is possible to account for such things as lowering morale following a defeat or a long route march.

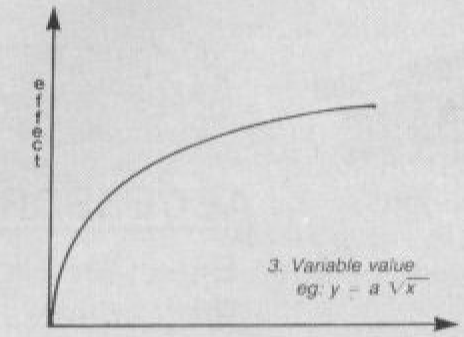
In individual games like Gladiator exhaustion during a fight is catered for, as the combat draws on the fighters become more vulnerable and less effective. Can they summon up those extra reserves of strength to deliver that crucial blow.

Often disregarded by the amateur who gets bogged down in computer code is the presentation of the game. Writing up games rules in an easy-to-follow, and imaginative way is part-and-parcel of producing a good game. If you are asking players to fit into a world of your making then you must bring that world to life for them.

Don't skimp over the rules you had to compromise your ideals on, every part of the game should be fitted into the context of the world and the rules and customs by which it works.

Mitre Wargames is based at Lothlorien, Stockdale, Heelands in Bucks.





1. This is a straight line function where the effect of this variable on the result is directly proportional to the value of the variable. By inverting the graph (downward sloping line) you would achieve an inversely proportional effect.
2. Bell curve. In this graph, the mid-range of valves for the variable would have the most effect. Obviously you can think of your own applications of all these curves, but this one would lend itself well to the application of luck in many games — the extremes having a markedly different effect to the majority. An inverse bell curve (upside-down!) might be even more appropriate here.
3. Diminishing marginal returns. With this function, each amount added to the value of the variable has less effect than the previous one. A useful function in the allocation of scarce resources if you feel they should be evenly spread between variables.
4. Increasing marginal returns. This function is the inverse 3. Here each increase in the value of the variable produces a greater effect than the previous one. Here you would be encouraging a greater divergence of values on variables, and more varied results.
5. This graph shows the mirror image of 4. Here each increase in the variable produces reduction in its effect on the game, with each fall producing a lesser decrease than the previous one.

	ATTACK TACTICS		
DEFENCE TATICS	Fast Break	Early Cross	Slow Build-up
Shadow Attackers	15%	30%	5%
Intercept Passes	30%	5%	15%
Use a sweeper	5%	15%	30%

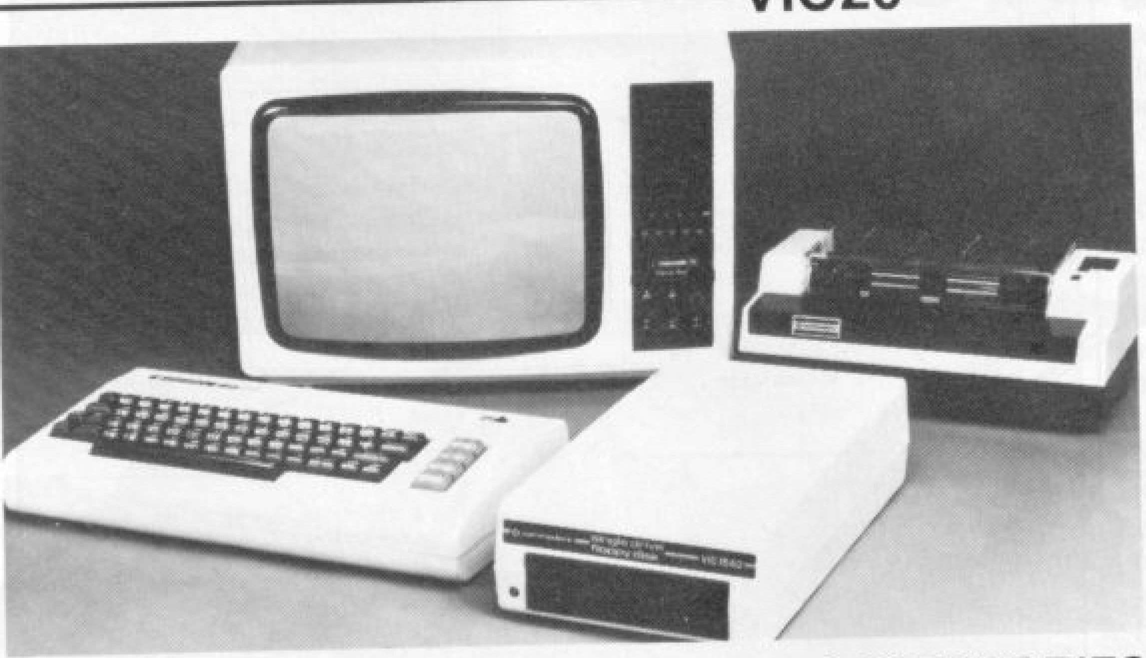
6. A simple matrix from World Cup Manager where the percentages indicate how team tactics influence a scoring chance in this particular situation. So playing a sweeper proves the best defence against a fast break.

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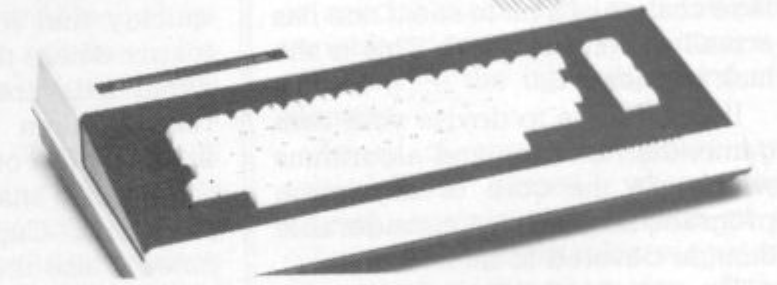
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CHESS



A common myth — particularly among non-players — is that grandmasters look at every possible variation for many moves ahead. A little calculation reveals that this must be false.

Suppose each side had 10 legal moves at every turn, then to look ahead three moves for each side would involve considering a million positions. A grandmaster may well need to look ahead at least 6 or 7 moves for each side during the course of a game and cannot possibly process all the necessary positions in the time allowed.

In any case there is no evidence that they even attempt to do so.

There is a famous remark attributed to the grandmaster Reti. When asked how many moves he saw ahead, Reti is alleged to have replied: "only one move — the right one".

The Dutch psychologist Adriaan de Groot made a study of what factors determined chess skill in the 1930s and 1940s and published his findings in a classic work *Thought and Choice in Chess.* To do justice to this book would require many articles, but a few examples will give the flavour of the work.

In one experiment, de Groot showed a series of unfamiliar positions to chess players at all levels of skill from world championship level (Alekhine, Keres and Euwe were all included) to club players.

Each player's task was to choose a move and think out loud while doing so.

De Groot recorded their verbal statements and used them to estimate how much searching each player carried out in finding a move. Figure 1 shows one of de Groot's positions, with White to play. You may like to try it yourself before reading on.

The results cast an interesting light on grandmaster skill particularly in relation to the nearest group of lesser players, designated as "experts".

There were five grandmasters tested and four of them chose the correct move in Figure 1. None of the five experts tested picked it.

Why can't a computer think like a man? Even the best chess-playing machines searching huge trees of variations have still not reached master standard and only a few are good enough to trouble the strong amateur human player.

Might it not be better to approach the problem another way — how do grandmasters think?

All the grandmasters mentioned the correct move at some point in their analysis, but only 2 of the 5 "experts" did.

Measurements of time taken to make a decision, number of moves considered etc. did not convincingly differentiate the two groups, with one exception: the "value" they estimated for the chosen move where the grandmasters were much more accurate.

Revealing the average depth of search for both grandmaster and "expert" on Figure 1 was much less than some might have expected, a relatively humble seven ply — four moves for White and three for Black.

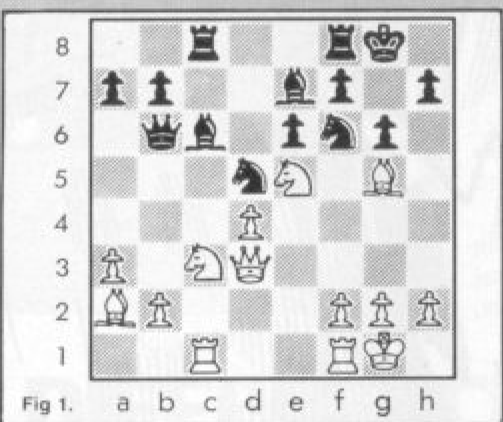


Fig 1.

The "millions" of variations supposedly explored had also shrunk to an average of 35 moves in total. It seems clear that the grandmasters were able to *perceive* some feature of Figure 1 which the experts could not, even though they were able to analyse just as well in every measurable way.

In case you have not yet found the correct move, it is BxN(Q5)).

A second experiment reinforced and clarified the importance of perception in chess. This time de Groot again permitted his subjects to look at a position again permitted his subjects to look at a position from an unfamiliar game, but only for a few seconds.

The task was then to recall the position, for example by setting it up on an empty board.

The results of this experiment were intriguing, grandmasters and masters recalled approximately 93% of pieces correctly, experts recalled 72% and lower-level players recalled about 51%.

However, when the same experiment was repeated with randomised — possibly illegal — positions of pieces, the grandmasters' advantage vanished.

All the subjects performed equally badly, recalling only 3 or 4 pieces correctly.

It is reasonable to deduce that on the former task (recalling "genuine" positions), the grandmasters were recalling not individual disjoint piece positions, but clusters of pieces or significant patterns.

To illustrate this, consider Figure 1 again — although it was not, in fact, one of the positions used in the second experiment.

A cursory inspection shows a King-side castled formation for both sides, Queen Rooks opposed on an open file, two knights on "Bishop 3", an isolated Queen Pawn on Q4 supporting a White Knight on K5 and blockaded by a Black Knight on Q4.

There is a White Bishop on KN5 pinning the Knight on Black's KB3 which is defended by a Bishop on K2. Black has a *fianchettoed* Bishop pawn formation (KB2, KN3, KR2) although his King's Bishop is out of place.

These are all features which occur in innumerable positions, but would not be recognised by the beginner — or the computer.
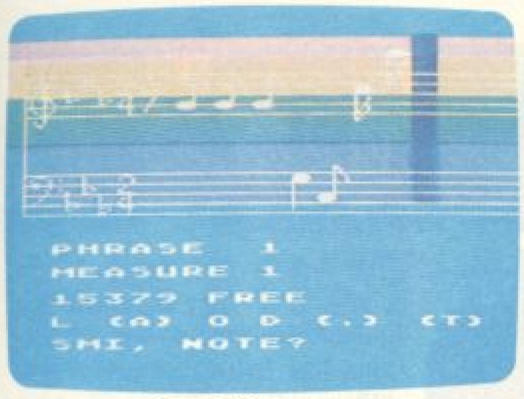
Where does all this leave us? Grandmasters seem to analyse no better than experts, but recognise more features of a position which somehow prompt them to find good moves.

How many features are there altogether? If we could identify them and put them into a program, would we have a "grandmaster program"? I will return to this topic next month.

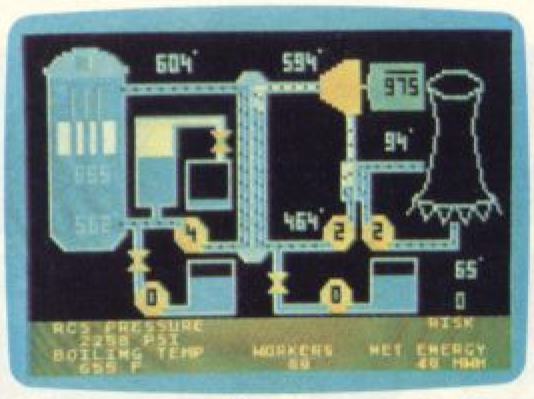
BY MAX BRAMER



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SCREAMING FOUL UP
THE BUGS
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KNOCK!
ARE YOU IN THE COMPUTER UNCLE STAN? KNOCK ONCE FOR YES...
KNOCK!
YOU ARE IN THE COMPUTER AUNTIE FLO ALWAYS SAID YOU'D WANTED TO GET INTO NEW TECHNOLOGY..
..IT'S ABOUT THAT NEST EGG YOU HAD HIDDEN AWAY .. WELL I COULD REALLY DO WITH SOME DISC DRIVES..
TAP!
SHRIEK!!!
CHOMP!
KEY LIFTED OPEN!
THROB!
STOMP!
PACMAN
THANKS A LOT BOYS, WE COULDNT HAVE STOOD ONE MORE TURN AROUND THAT MAZE!
HEE! HEE! HEE!
WORST CASE OF PACMAN FINGER I'VE EVER SEEN!



Music Composer



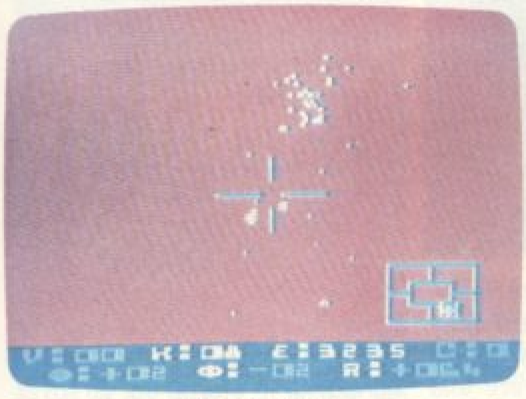
Scram



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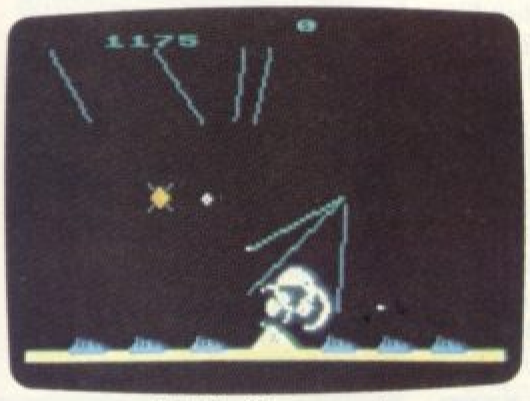
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Star Raiders



European Countries



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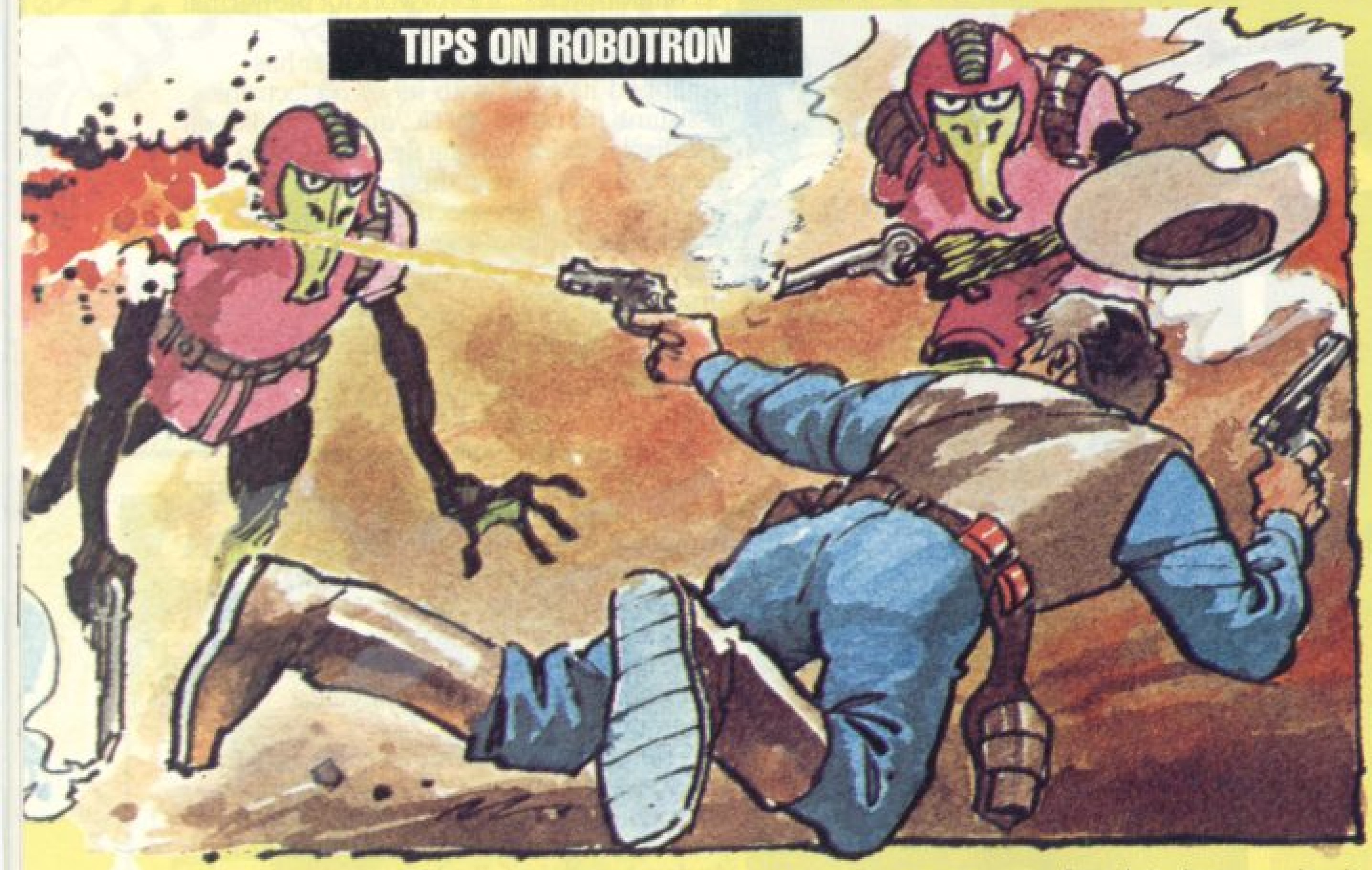
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ARCADE

TIPS ON ROBOTRON



Arcade games don't come any more forbidding than Robotron. To the uninitiated, the screen appears as a chaotic whirr of activity ... add the unfamiliar two joystick control and the odds seem impossible.

The game is the invention of former Williams' game designer Eugene Jarvis, who was responsible for Defender.

Robotron sets you down in a screen full of rampaging robots with the task of saving the man, woman and child clones. These clones are the way to large scores, the first one you save is worth 1,000 points, the second 2,000 and so on up to 5,000.

The early walls are deceptively easy and should be used to become acclimatised to the controls. The left joystick moves the player in eight directions, the right enables the player to fire in eight directions. Practise moving and firing diagonally.

Wave one introduces you to the Grunt, your first robotic foe. Grunts (100 points) are the cannon fodder in Robotron they wander around but cannot fire and you should ensure that the two clones on this screen are rescued before you destroy the last Grunt. Finishing off all the Grunts and the wave.

Wave two brings on the indestructible Hulks which can be halted by a hit but not killed. The

A BRAIN WAVE OF A GAME

Spheroids (1,000 points) are the main priority on this wave. They lay Enforcers (200 points) which look rather like fire hydrants and spray out fire at you. Stay out of the way of the Hulks, blast the Spheroids and Enforcers, then finish off the Grunts and scoop up the humanoid clones before the Hulks kill them.

The third and fourth (and sixth and eighth) waves feature the same foes but there are inevitably more of them and they become more aggressive. Spheroids often start in corners and are vulnerable to the player who has mastered diagonal fire from the centre of the screen.

Wave five is known as the Brainwave. The Brains are particularly dangerous as they can turn your clones against you and fire deadly cruise missiles which track your man.

First priority is to eliminate the single Spheroid and then blast the Brains quickly for 500 points each. Cruise missiles can be run from when there is more than one of them. They will chase you but soon fall into an easily blastable line behind you, turn and fire.

When Brains find a clone they jump them up and down and turn them into deadly Progs. These are then fired at you and you have to react quickly to escape.

Wave seven introduces the Tanks (300 points). These start life as blue spirals, Quarks, which sit passively on the screen. Don't be misled, these should be blasted as quickly as possible. You won't get all the Quarks but try to single out those which are developing for quick attention. Fully formed Tanks will fire cannonballs at you, which can rebound off walls to get you from behind.

Wave nine is given over to Grunts, blast your way quickly through to a wall and then tackle the Enforcers.

Brains reappear on the 10th, 15th and 20th wave and wave 22 brings in a deadly combination of Tanks and Enforcers and after wave 40 it starts up all over again.

It is possible to blast your way out of very tight corners by using the old Asteroids technique of moving and firing towards the enemy. Don't let the corner-loving Enforcers trap you in one and keep the Hulks away from your main source of points, the clones.

Different operators set different bonus life levels so shop around for five lives and a bonus every 12,000 to learn on.

ARCADE MISS IS A HIT

MS PACMAN

Ms Pacman, the first lady of the American arcades, is to make her debut in the U.K.

We featured this female of the carnivorous maze species in an article on the arcade industry's assault on women players.

Most British distributors have fought shy of introducing this lady to our shores, but now a "conversion" kit is out and don't be too surprised if the Pacman in your local pub or arcade develops curling eye-lashes and takes to wearing a bow.

Apart from these understandable additions to her appearance, Ms Pacman will also feature four mazes for the newcomer to try his hand at. Three of these have an additional two side exits.

Dots still score 10 points each with energizers adding 50 to the total. As with the usual Pacman, Ms Pacman munches 200 points on the first ghost, 400 for the second and so on.

When she is caught, Ms Pacman dramatically swoons and falls... and the cliches don't quite stop there, the between screen displays feature Pacman chases the new Ms across the screen, then she chases him and finally the delivery of the Pac-baby.



The ghosts are still as you remember them, except that one of these has now undergone a sex-change operation and is affectionately known as Sue.

Illustration: Jon Davis

ACTION

THE LOST ARC OF THE COSMOS

SPACE DUNGEON

The search for cosmic treasures takes place in Space Dungeon, a new game which is being tried out at a few locations in Britain.

Space Dungeon uses the Robotron design: a two joystick control for moving around the screen and eight-way fire.

You play the part of a raider who can penetrate the cosmos to discover its riches. A radar screen helps to plan your tactics and manoeuvres as you try to evade the guards and other thieves to grab the treasures and follow the arrows to the Bonus Room.

Points for collected treasure are scored only after a level of the dungeon is completely explored. Each level, of a possible 99, has 16 treasures and 36 rooms. The deeper the dungeon, the player strikes, the more valuable the treasure but the greater the danger.

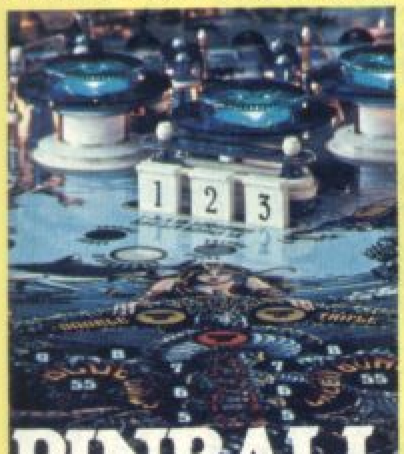
The main rival for the treasures is the Thief who will steal away your bounty. A direct hit will make him drop it. Watch out for the hovering Spore Case, a hit on this will result in a frenzy of deadly Spores attacking you.

If you lose a life, your treasure is shown on the radar screen and can be returned to later.

The treasures are: iron crosses, copper pieces, silver stars, a golden fleece and a platinum ark. Among the dangers are an Executioner, the Enforcer, Death Squares, Guards, Piker Ships and a mysterious creature called a Corner Zapper.

Like Tempest, Space Dungeon lets you enter the game at a level suited to your skills, you can inflict untold damage on the easy levels or go for a more dangerous level with the increased rewards it brings — but, of course, more risks.

The graphics in the game are not realistic but have a symbolic design and the signs are that Space Dungeon is proving popular enough for more widespread distribution soon.



PINBALL

Can you become a pinball Mastermind? That's the challenge issued by the latest machine from Bally — called Spectrum.

You have to crack the colour code set up by the pin's built-in computer brain while you play. You must hit targets to light up coloured lights in the correct order. If you crack the table's code — it can choose from 256 combinations — you win a big bonus. If you manage to get your ball into one of the three kick-out holes featured on the playfield the machine will give you a clue — indicating which target lights you should aim for.

A novel feature of this particular pin is that the ball is fired onto the playfield using the right-hand flipper button.

It's a table that will keep you guessing.

Also new from the Bally stable this month is Speakeasy — a return to good old fashioned pinball concepts. It has a card game theme — traditional in pinball — and includes Add-a-Ball and Subtract-a-Ball features. It also has a roulette wheel on the playfield which spins each time you lose a ball, giving bonuses.

OUTLINE

DON'T STEP OUT OF LINE

Try to outwit the Outline machine. You can never win but you can achieve a good *draw*.

Outline is a chase game on a series of changing grids. You control a drawing marker which runs along the lines of the grid, responding to a simple joystick control. Behind you comes the chaser leasing his own marking across the grid pattern.

You can keep him at a distance by employing a gap button to prevent him catching you. Like Amidar, the screen colours-in every square successfully surrounded by your lines.

When the chaser is left behind a gap he must retrace his tracks and find another route to get to your marker or wait until the gap closes again.

If he doesn't catch you and the screen is filled in, you can progress to a new grid pattern. You can start at different levels of difficulty and it is possible to have more than one chaser after you.

In the later stages you will find the machine talking to you and the chasers are equipped with missiles to fire after you.

One trap a lot of beginners fall into is, being cut off at a corner between two of their own gap barriers. A mistakenly pushed gap button leaves you helpless while the chaser waits patiently for the gap barrier to clear.

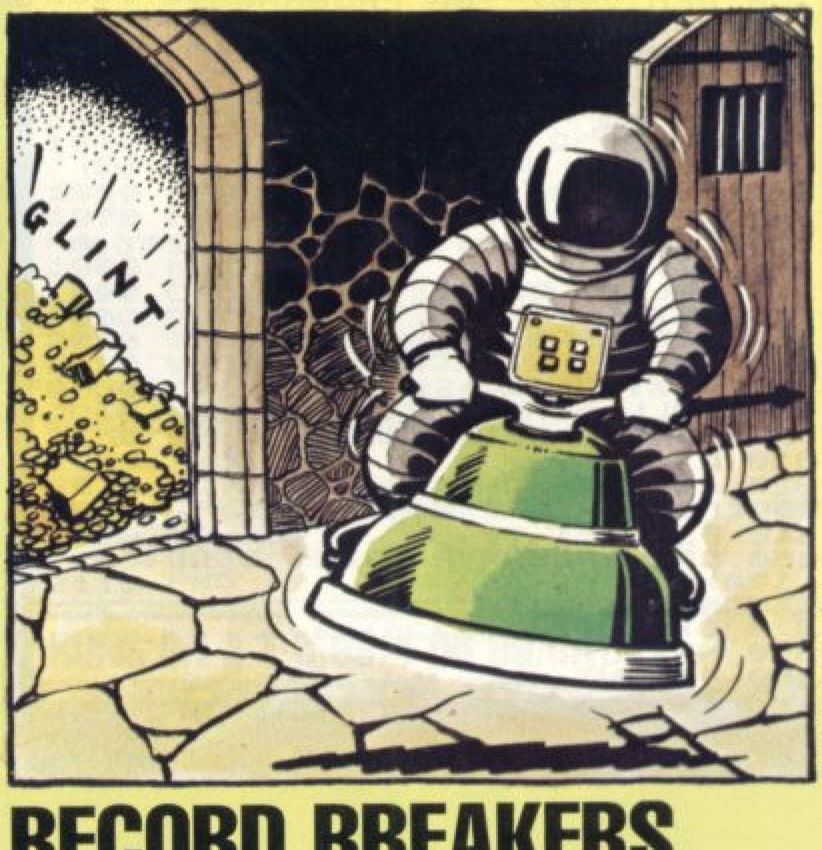


Illustration: Terry Rogers

RECORD BREAKERS

A whole host of new machines are making an appearance on Record Breakers for the first time.

We have also received a good deal of correspondence about an older machine, Defender from people who regularly score over a million. The reason Defender was not included is that some players can now continue playing for as long as the arcades remain open.

The Battle Zone and Missile Command games are also going this way and I am closing the file on these.

TEMPEST 495,481 Richard Holt	DONKEY KONG 428,300 John Bull	PACMAN 1,050,900 Tim Haywood
SCRAMBLE 871,460 R. Cotton	DIG DUG 591,430 Stephen Broadbent	CENTIPEDE 305,000 Chris Caton
GORF 886,030 Chris Murray	QIX 263,820 Sarbjit Singh	HYPERBALL 1,448,060 Nick Starkings
FROGGER 87,050 Danny Blackmoor	CRUSH ROLLER 471,530 Alan Dowler	PHEONIX 409,630 John Danvers



Illustration: Dorian Cross

```
100 CALL SCREEN(2)
110 CALL CLEAR
120 REM ****SPACE LASER****
130 REM *BY GM PROGRAMS*
140 REM ****************
150 RANDOMIZE
160 SD=1000
170 XV=0
180 LAS=3
190 FUEL=32
200 AO=500
210 KS="BRASS=" & STRS (LAS)
220 FOR Y=1 TO LEN (K$)
230 CALL HCHAR(1,22+Y,ASC(SEG$(K
$,Y,1)))
240 CALL SOUND(1,-3,0)
250 NEXT Y
260 FOR CHAN=1 TO 8
270 CALL COLOR(CHAN,7,1)
280 NEXT CHAN
290 CALL HCHAR(24,1,152,32)
300 VB=INT (RND*14)*2+4
310 X=32
320 CV=INT (RND*18)+5
330 CALL HCHAR(CV,VB,136)
340 FOR A=1 TO 30
350 CALL HCHAR(RND*20+1,RND*30+1
,120)
360 NEXT A
370 CX=INT (RND*28)+4
380 NM=23
390 PO=INT (RND*13)*2+6
```

```
400 CALL CHAR(96,"7E7E3C3C181800
00")
410 CALL CHAR(104,"101010101010101
010")
420 CALL CHAR(112,"0000163066301
800")
430 CALL CHAR(136,"EEEEEEEEEEEE
EEE")
440 CALL CHAR(120,"1")
450 CALL CHAR(128,"FE1EFE1EFE1EF
E1E")
460 CALL CHAR(144,"F3F4500CA5E3F
207")
470 CALL CHAR(152,"FFFFFFFFFFFFF
FFF")
480 CALL COLOR(9,14,1)
490 CALL COLOR(15,7,11)
500 CALL COLOR(16,2,2)
510 CALL COLOR(14,11,1)
520 CALL COLOR(10,10,1)
530 CALL COLOR(13,7,1)
540 CALL COLOR(11,6,1)
550 CALL HCHAR(24,1,128,32)
560 CALL HCHAR(3,PO,96)
570 CALL HCHAR(NM,CX,32)
580 NM=NM-1
590 IF INT (RND*2)=1 THEN 1030 E
LSE 1050
600 IF NM<=1 THEN 1070
610 IF CX<=2 THEN 1250
620 IF CX>=30 THEN 1270
630 CALL HCHAR(NM,CX,112)
640 F=INT (RND*16)+1
650 CALL COLOR(12,F,1)
660 CALL KEY(0,K,S)
670 IF K=32 THEN 710
680 IF K=83 THEN 950
690 IF K=68 THEN 990
700 GOTO 570
710 IF NM<=2 THEN 1070
720 CALL VCHAR(4,PO,104,NM-3)
730 CALL SOUND(-100,4000,0)
740 X=X-2
760 IF X=10 THEN 1710
770 CALL VCHAR(4,PO,32,NM-3)
780 CALL HCHAR(24,1,152,32-X)
785 IF X=0 THEN 2080
790 IF CX=PO THEN 820
800 IF PO=VB THEN 1480
810 GOTO 570
820 CALL SOUND(1000,-5,1,110,5)
830 CALL HCHAR(NM,CX,144,2)
840 CALL HCHAR(NM,CX,32,2)
850 CALL HCHAR(NM+1,CX,144,2)
860 CALL HCHAR(NM+1,CX,32,2)
870 CX=INT (RND*28)+4
880 NM=23
890 SC=SC+28.86
900 C$="SCORE=" & STRS (SC)
910 FOR M=1 TO LEN (C$)
920 CALL HCHAR(1,2+M,ASC(SEG$(C$
,M,1)))
930 NEXT M
940 GOTO 570
950 REM LEFT
960 CALL HCHAR(3,PO,32)
970 PO=PO-2
```

SPACE LASER

```
980 GOTO 560
990 REM  RIGHT
1000 CALL HCHAR(3,PO,32)
1010 PO=PO+2
1020 GOTO 560
1030 CX=CX+INT (RND*3)
1040 GOTO 600
1050 CX=CX-INT (RND*3)
1060 GOTO 600
1070 XV=XV+1
1080 IF XV<3 THEN 1790
1090 CALL SOUND(100,110,0)
1100 V$="   G A M E   O V E R"
1110 FOR A=1 TO LEN (V$)
1120 CALL SOUND(100,294,0)
1130 CALL HCHAR(12,3+A,ASC(SEG$(
V$,A 1)))
1140 CALL SOUND(100,330,0)
1150 NEXT A
1160 CALL SOUND(1100,110,0,4000,
2)
1170 BN$="YOUR SCORE IS" & STR$ (SC)
1180 FOR A=1 TO LEN (BN$)
1190 CALL HCHAR(16,6+A,ASC(SEG$(
BN$,A,1)))
1200 NEXT A
1210 IF X=0 THEN 1670
1220 IF SC>=533.83 THEN 1380
1230 GOTO 1290
1240 STOP
1250 CX=CX+1
1260 GOTO 6200
1270 CX=CX-1
1280 GOTO 620
1290 PRINT "   P L A Y   A G A I
 N"
1300 CALL KEY(0,K1,S1)
1310 KL=KL+1
1320 IF KL=500 THEN 1240
ELSE 1340
1330 IF S1=0 THEN 1300
1340 IF K1=32 THEN 1350 ELSE 130
0
1350 SC=0
1355 KL=0
1360 GOTO 100
1370 STOP
1380 PRINT "      ** BONUS GAME
**"
1390 CALL CHAR(112,"183C7EFF183C
5A99")
1400 CALL SOUND(100,262,0)
1410 CALL SOUND(100,524,0)
1420 CALL SOUND(100,392,0)
1430 CALL SOUND(100,440,0)
1440 CALL SOUND(100,349,0)
1450 CALL SOUND(1000,110,0,-5,0,
4000,0,500,0)
1460 SC=0
1470 GOTO 100
1480 CALL SOUND(1000,-1,0)
1490 X=32
1500 FUEL=FUEL-1
1510 CALL HCHAR(24,FUEL,128)
1520 AO=AO+10
1530 CALL SOUND(-50,AO,0)
1540 IF FUEL=1 THEN 1550 ELSE 15
00
1550 SC=SC+167.45
1560 FOR DOWN=CV TO 20
1570 CALL HCHAR(DOWN,VB,136)
1580 CALL SOUND(1,SD,0)
1590 SD=SD-50
1600 CALL HCHAR(DOWN,VB,32)
1610 NEXT DOWN
1620 V5=0
1630 CALL CHAR(112,"FF186C7EFFFF
5A99")
1640 CALL CHAR(96,"AAFF7EFFFF818
18119")
1650 CALL CHAR(104,"818181818181
8181")
1660 GOTO 900
1670 CALL SOUND(1000,500,0)
1680 CALL SOUND(1000,1000,0)
1690 PRINT "        * OUT OF FUEL *
"
1700 GOTO 1290
1710 FOR O=6 TO 16
1720 CALL COLOR(13,O,O)
1730 CALL SOUND(1,-1,0)
1740 CALL SOUND(1,-2,0)
1750 NEXT O
1760 CALL COLOR(13,7,1)
1770 GOTO 770
1780 STOP
1790 CALL HCHAR(NM,CX,32)
1800 CALL VCHAR(4,PO,32,NM)
1810 IF XV>2 THEN 1090
1820 NM=23
1830 FOR SO=1000 TO 900 STEP -5
1840 CALL SOUND(-SO,SO,0)
1850 NEXT SO
1860 W=32
1870 JK=500
1880 CALL HCHAR(24,W,128)
1890 CALL SOUND(-50,JK,0)
1900 JK=JK+10
1910 W=W-1
1920 IF W=0 THEN 1930 ELSE 1880
1930 X=32
1940 LAS=LAS-1
1950 KS="BASES=" & STR$ (LAS)
1960 FOR Y=1 TO LEN (K$)
1970 CALL HCHAR(1,Y+22,ASC(SEG$(
K$,Y,1)))
1980 NEXT Y
1990 CALL SOUND(10,-3,0)
2000 GOTO 660
2010 STOP
2020 W=32
2030 CALL HCHAR(24,W,128)
2040 W=W-1
2050 IF W=0 THEN 2060 ELSE 2030
2060 X=32
2070 GOTO 670
2080 IF XV<3 THEN 2090 ELSE 1100
2090 XV=XV+1
2100 GOTO 1790
2110 END
```

RUNS ON A T.I. 99/4 OR 99/4A

Space Laser is Invaders with a difference. You are the attacker, controlling a laser firing base at the top of the screen while aliens come at you from their planet below.

You are moving gradually down toward the planet's surface and have to blast the aliens as they move to defend their home.

You move your base using the cursor keys to intercept the aliens who move in a zig-zag pattern across the screen. The space key fires your laser.

Once you hit the planet — unless you've used all your three lives — you get more fuel and another chance to zap the aliens. There is a bonus game feature built in and your score is shown continuously.

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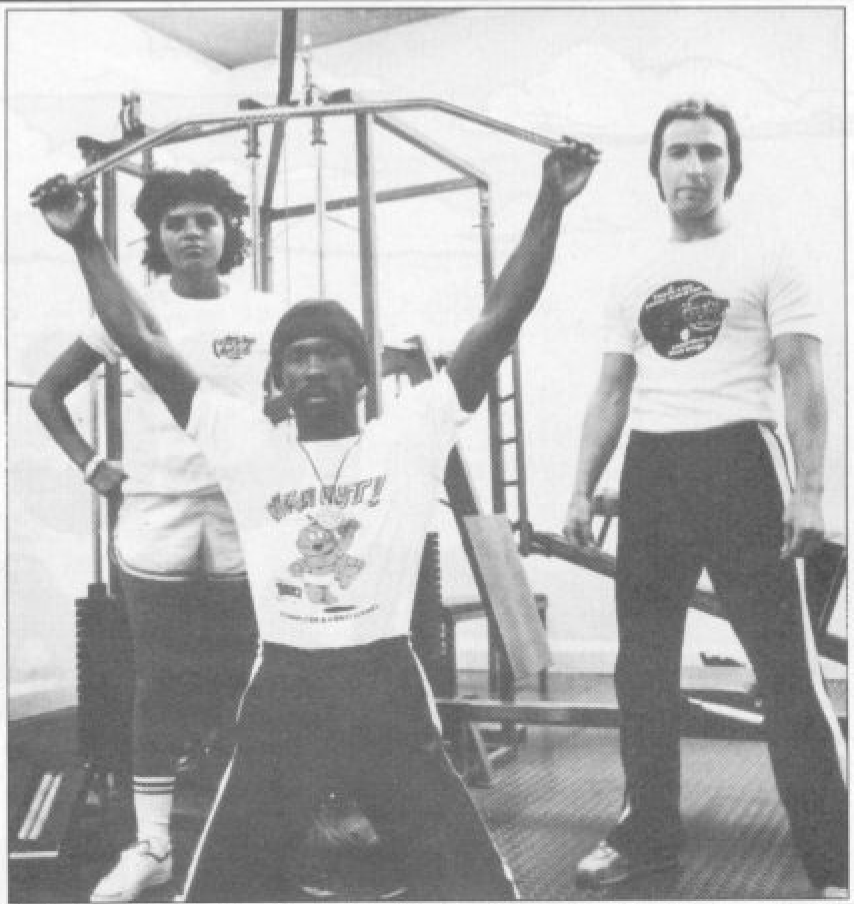
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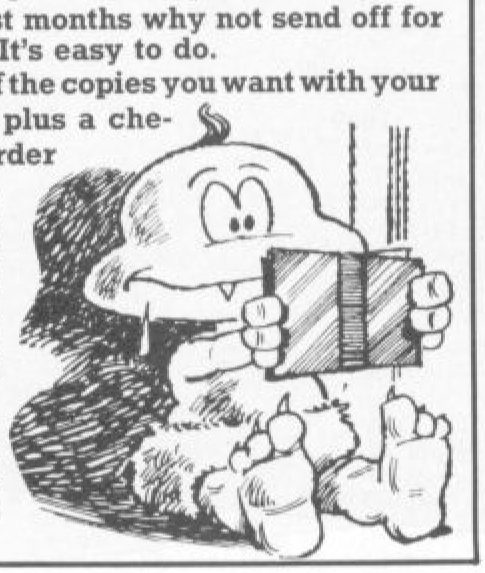
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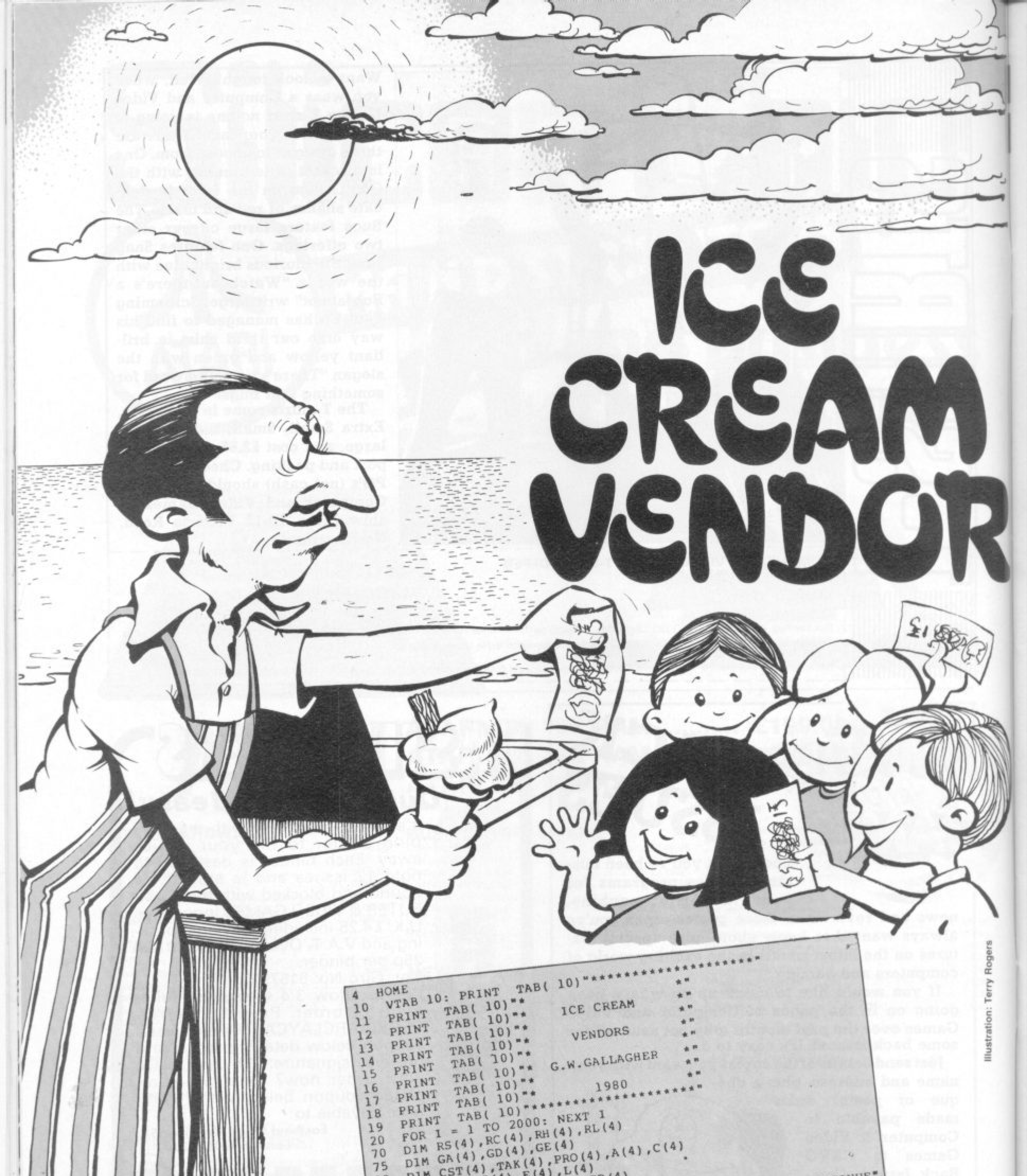
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ICE CREAM VENDOR

```
4   HOME
10  VTAB 10: PRINT  TAB( 10)"********************"
11  PRINT  TAB( 10)"*                  *"
12  PRINT  TAB( 10)"*    ICE CREAM     *"
13  PRINT  TAB( 10)"*                  *"
14  PRINT  TAB( 10)"*     VENDORS      *"
15  PRINT  TAB( 10)"*                  *"
16  PRINT  TAB( 10)"*  G.W.GALLAGHER   *"
17  PRINT  TAB( 10)"*                  *"
18  PRINT  TAB( 10)"*       1980       *"
19  PRINT  TAB( 10)"********************"
20  FOR I = 1 TO 2000: NEXT I
70  DIM RS(4),RC(4),RH(4),RL(4)
75  DIM GA(4),GD(4),GE(4)
80  DIM CST(4),TAK(4),PRO(4),A(4),C(4)
90  DIM D(4),S(4),E(4),L(4)
92  DIM PA(4),PB(4),PE(4),PD(4)
95  GOTO 2100
100  PRINT "PRESS SPACE BAR WHEN YOU ARE READY TO    CONTINUE"
110  GET A$: IF A$ = "" THEN  GOTO 110
120  RETURN
200  FOR I = 1 TO V: IF A(I) - 9 < 1 THEN P(A) = 1: GOTO 240
210  IF A(I) - 9 < 3 THEN PA(I) = .7: GOTO 240
220  IF A(I) - 9 < 6 THEN PA(I) = .5: GOTO 240
230  IF A(I) - 9 < 10 THEN PA(I) = .25: GOTO 240
```

RUNS ON AN APPLE

OR A PET IN 6K

BY G. W. GALLAGHER

Illustration: Terry Rogers

```
235 PA(I) = 0
240  NEXT I
250  RETURN
400  FOR I = 1 TO V: IF D(I) - 10 < 1 THEN PD(I) = 1: GOTO 440
410  IF D(I) - 10 < 3 THEN PD(I) = .7: GOTO 440
420  IF D(I) - 10 < 6 THEN PD(I) = .5: GOTO 440
430  IF D(I) - 10 < 10 THEN PD(I) = .25: GOTO 440
435 PD(I) = 0
440  NEXT I
450  RETURN
500  FOR I = 1 TO V: IF E(I) - 5 < 1 THEN PE(I) = 1: GOTO 540
510  IF E(I) - 5 < 3 THEN PE(I) = .7: GOTO 540
520  IF E(I) - 5 < 6 THEN PE(I) = .5: GOTO 540
530  IF E(I) - 5 < 10 THEN PE(I) = .25: GOTO 540
535 PE(I) = 0
540  NEXT I
550  RETURN
600 X(K) =  INT (X(K) * 100) / 100: RETURN
700  HOME : RETURN
800  PRINT "YOU HAVE OVERSPENT.TRY AGAIN ": PRINT : RETURN
1500  ON W GOTO 1505,1510,1520,1530,1540
1505 B$ = "SUNNY TEMP 28C":MKT = 1000: GOTO 1550
1510 B$ = "SUNNY TEMP 23C":MKT = 700: GOTO 1550
1520 B$ = "CLOUDY BUT DRY TEMP 20C":MKT = 500: GOTO 1550
1530 B$ = "SHOWERY TEMP 15C":MKT = 300: GOTO 1550
1540 B$ = " RAIN TEMP 10C":MKT = 100
1550  IF DAY = 6 OR DAY = 7 THEN MKT = MKT * 2
1560  RETURN
1700  IF DAY = 1 THEN A$ = "MONDAY"
1710  IF DAY = 2 THEN A$ = "TUESDAY"
1720  IF DAY = 3 THEN A$ = "WEDNESDAY"
1730  IF DAY = 4 THEN A$ = "THURSDAY"
1740  IF DAY = 5 THEN A$ = "FRIDAY"
1750  IF DAY = 6 THEN A$ = "SATURDAY"
1760  IF DAY = 7 THEN A$ = "SUNDAY"
1770  RETURN
2100  GOSUB 700
2105  PRINT "YOU ARE THE OWNER OF AN ICE-CREAM VAN": PRINT
2110  PRINT "TRADING ON THE SEA FRONT AT": PRINT
2120  PRINT "DALY-BY THE SEA": PRINT : PRINT
2130  PRINT "EACH MORNING YOU BUY YOUR STOCK AT THE": PRINT
2140  PRINT "DEPOT,ESTIMATING YOUR LIKELY SALES"
2150  PRINT : PRINT : GOSUB 100
2160  GOSUB 700
2170  PRINT "YOU SELL 3 DIFFERENT PRODUCTS": PRINT
2180  PRINT "1.  CONES WITH SOFT ICE-CREAM FILLING": PRINT
2190  PRINT "  THE CONES COST YOU 3 PENCE EACH": PRINT
2200  PRINT "  AND THE FILLING 6 PENCE PER CONE": PRINT
2210  PRINT "2.  CHOC-ICES WHICH COST YOU 10 PENCE": PRINT
2220  PRINT "  EACH": PRINT
2225  PRINT "3.  ICE-LOLLIES WHICH COST YOU 5 PENCE": PRINT
2226  PRINT "     EACH"
2230  PRINT : PRINT : GOSUB 100
2240  GOSUB 700
2245  PRINT "THERE MAY BE 1,2,3 OR 4 VANS TRADING": PRINT : PRINT
2250  PRINT "IN THE AREA": PRINT : PRINT
2270  PRINT "HOW MANY VANS DO YOU CHOOSE"
2275  INPUT V: IF V > 4 THEN  GOTO 2270
2280  IF  INT (V) < V THEN  GOTO 2270
2290 DAY = 0: FOR I = 1 TO 4:X(I) = 100:SS(I) = 0:SC(I) = 0:SH(I)
= 0:SL  NEXT I
2300  FOR D = 1 TO 7
2305 DAY = DAY + 1
2315 W =  INT ( RND (1) * 5) + 1: GOSUB 1500
2320  FOR K = 1 TO V
2323  GOSUB 1700
2326  GOSUB 700
2328 Q = X(K)
2330  PRINT "     VAN";K;"      ";A$: PRINT
2340  PRINT "WEATHER FORECAST";B$: PRINT
2350  PRINT "CASH IN HAND  ";X(K);" POUNDS": PRINT
2360  PRINT "HOW MANY CONTAINERS OF SOFT ICE-CREAM": PRINT
2370  PRINT "DO YOU WISH TO BUY AT 6 POUNDS EACH": PRINT
2380  PRINT "(1 CONTAINER PROVIDES 100 PORTIONS": PRINT
2390  INPUT S(K): IF S(K) * 6 <  = X(K) THEN  GOTO 2397
2395  GOSUB 800: GOTO 2390
2397 X(K) = X(K) - S(K) * 6: GOSUB 600
2398  PRINT "CASH IN HAND "X(K);" POUNDS": PRINT
2400  PRINT "HOW MANY CONES AT 3 PENCE EACH": PRINT
2410  INPUT C(K): IF C(K) * .03 <  = X(K) THEN  GOTO 2417
2415  GOSUB 800: PRINT : GOTO 2410
2417 X(K) = X(K) - C(K) * .03: GOSUB 600
2419  PRINT "CASH IN HAND ";X(K);" POUNDS": PRINT
2420  PRINT "HOW MANY CHOC-ICES AT 10 PENCE EACH": PRINT
```

Can you tell the difference between a Lolly-Gobble-Choc-Bomb and a Face-Freezin' Fruit Fantasy? You can! Well this is the game for you. But you'll have to be a real cool customer to become a top ice-cream vendor at Microville-by-the-Sea. Up to four players can take part in this buying and selling game.

Each player runs a van selling ices and lollies at our favourite seaside resort. You are in charge for just seven days and each morning you must buy up stock — keeping a careful eye on the weather forecast as the number of customers you get will obviously vary according to the variable sunshine factor — and if it's a weekday or weekend.

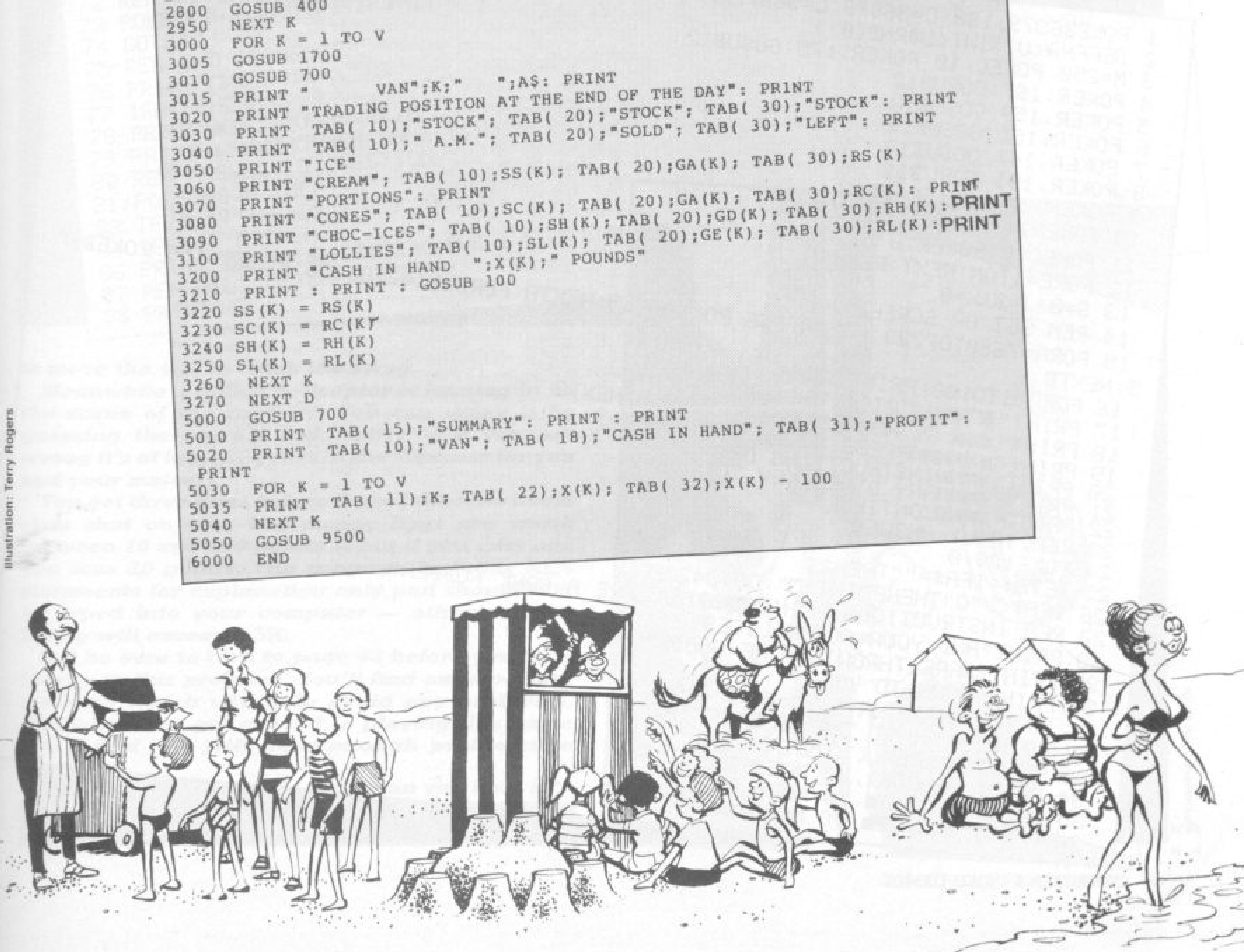
So check out your chimes and start praying for a heatwave! The program will work for both Apple II and Pet, the only difference in the listing being line 700 which is a subroutine for clearing the screen. To be absolutely fool-proof the Pet programmer would need to ensure that pressing READY by mistake would not break the run.



ICE CREAM VENDOR

```
2430  INPUT CH(K): IF CH(K) * .1 <  = X(K) THEN  GOTO 2438
2435  GOSUB 800: PRINT : GOTO 2430
2438 X(K) = X(K) - CH(K) * .1: GOSUB 600
2439  PRINT "CASH IN HAND ";X(K);" POUNDS": PRINT
2440  PRINT "HOW MANY LOLLIES AT 5 PENCE EACH": PRINT
2450  INPUT L(K): IF L(K) * .05 <  = X(K) THEN  GOTO 2458
2455  GOSUB 800: PRINT : GOTO 2450
2458 X(K) = X(K) - L(K) * .05: GOSUB 600
2459  PRINT "CASH IN HAND ";X(K);" POUNDS": PRINT
2470  PRINT : PRINT : PRINT "DO YOU WISH TO CHANGE ANYTHING"
2472  PRINT "TYPE YES OR NO"
2475  INPUT A$: IF A$ = "NO" THEN  GOTO 2482
2478  IF A$ = "YES" THEN X(K) = Q: GOTO 2326
2480  GOTO 2470
2482  GOSUB 700
2485 SS(K) = SS(K) + S(K) * 100
2490 SC(K) = SC(K) + C(K):SH(K) = SH(K) + CH(K)
2495 SL(K) = SL(K) + L(K)
2500  PRINT "WHAT IS YOUR SELLING PRICE FOR AN": PRINT
2505  PRINT "ICE-CREAM CONE IN PENCE": PRINT
2510  INPUT A(K)
2540  PRINT "WHAT IS YOUR SELLING PRICE FOR A": PRINT
2545  PRINT "CHOC-ICE IN PENCE": PRINT
2550  INPUT D(K)
2560  PRINT "WHAT IS YOUR SELLING PRICE FOR A": PRINT
2565  PRINT "LOLLY IN PENCE": PRINT
2570  INPUT E(K)
2572  PRINT : PRINT : PRINT "DO YOU WISH TO CHANGE ANYTHING"
2573  PRINT "TYPE YES OR NO"
2574  INPUT A$: IF A$ = "YES" THEN  GOTO 2500
2576  IF A$ = "NO" THEN  GOTO 2580
2578  GOTO 2574
2580  GOSUB 200
2590  GOSUB 400
2600  GOSUB 500
2700 GA(K) = PA(K) * MKT: IF GA(K) > SS(K) THEN GA(K) = SS(K)
2705  IF GA(K) > SC(K) AND SS(K) > SC(K) THEN GA(K) = SC(K)
2710 GE(K) = PE(K) * MKT: IF GE(K) > SL(K) THEN GE(K) = SL(K)
2715 GD(K) = PD(K) * MKT: IF GD(K) > SH(K) THEN GD(K) = SH(K)
2720 RS(K) = SS(K) - GA(K):RC(K) = SC(K) - GA(K)
2730 RH(K) = SH(K) - GD(K)
2740 RL(K) = SL(K) - GE(K)
2750 X(K) = X(K) + (GA(K) * A(K) + GD(K) * D(K) + GE(K) * E(K)) / 100
2760  GOSUB 600
2800  GOSUB 400
2950  NEXT K
3000  FOR K = 1 TO V
3005  GOSUB 1700
3010  GOSUB 700
3015  PRINT "       VAN";K;"     ";A$: PRINT
3020  PRINT "TRADING POSITION AT THE END OF THE DAY": PRINT
3030  PRINT  TAB( 10);"STOCK"; TAB( 20);"STOCK"; TAB( 30);"STOCK": PRINT
3040  PRINT  TAB( 10);" A.M."; TAB( 20);"SOLD"; TAB( 30);"LEFT": PRINT
3050  PRINT "ICE"
3060  PRINT "CREAM"; TAB( 10);SS(K); TAB( 20);GA(K); TAB( 30);RS(K)
3070  PRINT "PORTIONS": PRINT
3080  PRINT "CONES"; TAB( 10);SC(K); TAB( 20);GA(K); TAB( 30);RC(K): PRINT
3090  PRINT "CHOC-ICES"; TAB( 10);SH(K); TAB( 20);GD(K); TAB( 30);RH(K):PRINT
3100  PRINT "LOLLIES"; TAB( 10);SL(K); TAB( 20);GE(K); TAB( 30);RL(K):PRINT
3200  PRINT "CASH IN HAND  ";X(K);" POUNDS"
3210  PRINT : PRINT : GOSUB 100
3220 SS(K) = RS(K)
3230 SC(K) = RC(K)
3240 SH(K) = RH(K)
3250 SL(K) = RL(K)
3260  NEXT K
3270  NEXT D
5000  GOSUB 700
5010  PRINT  TAB( 15);"SUMMARY": PRINT : PRINT
5020  PRINT  TAB( 10);"VAN"; TAB( 18);"CASH IN HAND"; TAB( 31);"PROFIT":
 PRINT
5030  FOR K = 1 TO V
5035  PRINT  TAB( 11);K; TAB( 22);X(K); TAB( 32);X(K) - 100
5040  NEXT K
5050  GOSUB 9500
6000  END
```

Illustration: Terry Rogers





Illustrations: Jon Davis

RUNS ON A VIC-20 IN 3·5K

Well guv, there we were sitting in the old jam jar when everything went reels of cotton. The blag was going well and the boys was just about to leg it when the Old Bill turns up. Not yer ordinary rozzers though. These geezers fort they was angels. Swooping out of the sky in a bloomin' helicopter! It was enough to give you a real turn. The boys was throwing the swag in the back of the motor and I gave it some wellie and steamed off and that's when I ran into you guv. . . ."

This is a game of skill and chance. You are a bank robber and your gang is throwing their ill gotten gains down at the getaway car. You have

THE CR
BLAG

```
1 POKE36879,188:C=36878:L=36877:PRINT"[control chars]":H=0:R=36875:U$="[control chars]":F=30720
2 DEFFNA(U)=INT(U*RND(0))
3 M=250:POKEC,10:POKER,175:GOSUB12
4 POKER,167:GOSUB12
5 POKER,159:GOSUB12
6 POKER,151:GOSUB12
7 POKER,147:GOSUB12
8 POKER,191:GOSUB12
9 POKER,0:M=50:GOSUB12
10 POKER,191:M=250:GOSUB12
11 POKEC,0:POKER,0:GOTO13
12 FORE=1TOM:NEXT:RETURN
13 S=0:J=3:X=0
14 REM SET UP SCREEN
15 FORA=7680TO7723:POKEA,156:POKEA+F,5:NEXTA:FORB=8142TO8185:POKEB,156:POKEB+F,
5:NEXTB
16 FORG=1TO100:PRINT"[control chars]
17 PRINT"[control chars]CATCH THE GOODS"
18 PRINT"[control chars] BY HOWARD EVANS 1982.":NEXTG
19 PRINT"[control chars]PRESS [control chars] FOR"
20 PRINT"[control chars]INSTRUCTIONS OR"
21 PRINT"[control chars]ANY OTHER KEY TO"
22 PRINT"[control chars]CONTINUE"
23 REM INPUT ANSWER
24 POKE198,0
25 GETA$:IFA$=""THEN25
26 IFA$<>"Q"THENPRINT"[control chars]":GOTO42
27 REM INSTRUCTIONS:PRINT"[control chars]YOU ARE A BANK ROBBER"
28 PRINT"AND YOUR ACCOMPLICES"
29 PRINT"[control chars]ARE THROWING THE GOODS"
30 PRINT"DOWN TO YOU."
31 PRINT"[control chars]YOU HAVE TO MOVE THE"
32 PRINT"[control chars]VAN AT THE BASE OF THE"
33 PRINT"SCREEN,(TO CATCH THE"
34 PRINT"[control chars]GOODS),BY PRESSING:-"
35 PRINT"[control chars] TO MOVE RIGHT &"
36 PRINT"[control chars] TO MOVE LEFT"
```

OYDON

```
37 PRINT"▮PRESS ANY KEY TO"SPC(6)"CONTINUE"
38 GETH$:IFH$=""THEN38
39 PRINT"□"
40 REM BEGIN GAME;SET VARIABLES AND SET UP SCREEN
42 RS=FNA(5):FORA=8164TO8185:POKEA,160:POKEA+F,0:NEXT:IFRS>=4THENSG=22
43 PRINT"▮▮
44 PRINT"▮GOODS=\";S
45 PRINT"▮"SPC(14)"LIVES=";J
46 PRINT"▮▮HI-GOODS=\";H
47 PRINT"▮▮▮\\\\\\\\\\\\\\\\\\\\\\"
48 PRINT"▮▮▮\\\\\\\\\\▮BANK▮\\\\\\\\\"
49 PRINT"▮▮▮\\\\\\\\\\\\\\\\\\\\\\"
50 P=FNA(19):O=FNA((10)+1)*10:IFRS<4THENSG=44
51 T=P+7813
52 FORD=TTOT+330STEPSG
53 POKEC,9:POKEL,200:POKEL,0
54 POKED,156:POKED+F,4:POKED-22,32:POKED-44,32
55 REM MOVE VAN?
58 IFPEEK(197)=36ANDX<16THENX=X+1
59 IFPEEK(197)=33ANDX>0THENX=X-1
60 PRINT"▮▮▮▮▮▮▮▮"U$
61 PRINTTAB(X)" ▮▮┐▬▮\ ":PRINTTAB(X)" ▮▮└┘▬ "
   :PRINTTAB(X)" ▮● ● "
62 IFPEEK(D+22)<>32ANDPEEK(D+22)<>160THEN70
63 REM MOVE BAG
65 POKEC,0:NEXTD
66 REM MISSED BAG!
67 POKEC,10:POKED,32:POKED-44,32:POKED-22,32:S=S-20:POKER,128:M=100:GOSUB12
68 POKER,0:GOTO73
69 REM CAUGHT BAG!
70 S=S+O:POKED,32:POKED-44,32:POKED-22,32:POKE36876,200
71 M=100:GOSUB12:POKE36876,0
72 REM GOTO HELICOPTER SEQUENCE?
73 POKEC,0:Y=FNA(7):IFY=1THEN88
74 GOTO42
75 REM END SEQUENCE
76 PRINT"□▮▮GOODS=\";S
77 IFH<STHENH=S
78 PRINT"▮▮HI-GOODS=\";H
79 PRINTU$"▮▮ANOTHER GAME(Y,N)?"
80 REM ANSWER TO QUESTION
81 POKE198,0:INPUTV$
83 IFV$="Y"THENPRINT"□":GOTO3
84 IFV$<>"N"THEN76
86 PRINT"□▮"U$"▮▮▮▮▮▮OK,BYE BYE!":END
87 REM HELICOPTER SEQUENCE
88 PRINT"□"
```

to move the van to catch the swag.

Meanwhile a police helicopter is homing in on the scene of the robbery. You can delay it by guessing the correct code letter — if you are wrong it's at least 20 years in the slammer for you and your mates!

You get three lives before those jailhouse doors slam shut on you. The money bags are worth between 10 and 100 points — but if you miss one you lose 20 points. The program includes REM statements for explanation only and should NOT be typed into your computer — otherwise the listing will exceed 3.5K.

But be sure to turn to page 43 before you start keying in this program. You'll find an important message which will help avoid any problems. And when you get around to playing this game you'll find you will have enough problems to deal with.

Top score at present is 4760. Can you beat it?

BY HOWARD EVANS



```
89 VO=0:NU=0:POKE198,0
91 Q=8098:V=FNA(26)+65:IFX=16THENX=15
92 N$=CHR$(V)
96 FORI=1TO50
97 PRINT"■"
98 PRINT"■■LOOK OUT!":NEXTI
99 PRINT"■■■■COPS ARE COMING"
100 PRINT"■■TO LOSE THEM PRESS "
101 PRINT"■■THE CORRECT LETTER "
102 PRINT"■■KEY"
103 REM SET UP SCREEN
104 FORA=8164TO8185:POKEA,160:POKEA+F,0:NEXTA
105 VO=VO+NU:POKEC,VO:POKE198,0
106 PRINT"■■■■■■■"U$
107 PRINTTAB(X)" ■■■■■ ":PRINTTAB(X)" ■■■■ ":PRINTTAB(X)" ■■ ■■ "
108 REM POKE HELICOPTER ON
109 POKEQ,120:POKEQ+F,0:POKEQ-1,120:POKEQ-1+F,0:POKEQ-2,120:POKEQ-2+F,0:POKEQ-2
2,117
110 POKEQ-22+F,6:POKEQ-23,117:POKEQ-23+F,6:POKEQ-44,160:POKEQ-44+F,6:POKEQ-45,1
70
111 POKEQ-45+F,6:POKEQ-46,160:POKEQ-46+F,6:POKEQ-47,160:POKEQ-47+F,6:POKEQ-48,1
60
112 POKEQ-48+F,6:POKEQ-49,95:POKEQ-49+F,6:POKEQ-66,77:POKEQ-66+F,1:POKEQ-113+F,
0
113 POKEQ-67,160:POKEQ-67+F,6:POKEQ-68,233:POKEQ-68+F,6:POKEQ-71,219:POKEQ-71+F
,0
114 POKEQ-89,93:POKEQ-89+F,0:POKEQ-109,100:POKEQ-109+F,0:POKEQ-110,100:POKEQ-11
0+F,0
115 POKEQ-111,100:POKEQ-111+F,0:POKEQ-112,100:POKEQ-112+F,0:POKEQ-113,100
116 PRINT"■"U$"■■PRESS A KEY"
117 REM INPUT GUESS
118 POKEL,210:M=10:GOSUB12:POKEL,0
119 POKER,150
121 GETM$:IFM$=""THENPOKER,0:GOTO118
122 IFM$=N$THEN127
123 REM IS GUESS CORRECT?
124 IFPEEK(Q+1)<>32THEN136
125 REM GUESS WRONG ; MOVE HELICOPTER
126 PRINT"■":Q=Q+1:NU=1:GOTO104
127 PRINT"■■"U$"■■■YOU WERE LUCKY!"
128 PRINT"■■■■YOU GUESSED IT"
129 REM PLAY TUNE FOR CORRECT GUESS
130 POKEC,10
131 FORSY=128TO250STEP3
132 POKER,SY:M=30:GOSUB12:NEXTSY
133 REM GO BACK TO GAME
134 PRINT"■":POKEL,0:POKER,0:GOTO42
135 REM GUESSED WRONG!;CAUGHT BY COPS
LOSE A LIFE!
136 POKEL,0:POKER,0
137 PRINT"■■"U$
138 FORZ=1TO50:PRINT"■
":PRINT"■■■■■YOU'RE NICKED!!!":NEXTZ
139 PRINT"■■■■THE LETTER WAS ";N$
141 POKEC,10
142 POKER,201:M=250:GOSUB12
143 POKER,191:M=250:GOSUB12
144 POKER,207:M=150:GOSUB12
145 POKER,201:M=250:GOSUB12
146 POKER,191:M=450:GOSUB12
147 POKEC,0:POKER,0:GOTO149
149 J=J-1:S=S-100
150 IFJ=0THENPRINT"■":GOTO76
151 PRINT"■":GOTO42
```



NOTE, A '\' OR A '■' IS A
POUND SIGN ON THE VIC20
THIS IS BECAUSE THIS PROGRAM
WAS LISTED ON A PET PRINTER

Illustrations: Jon Davis

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URANIUM CORE



Illustration: Jon Davis

It's the 21st Century and man can travel all over the galaxy, has learnt the secret of virtual immortality and how to use an electro-static tooth-brush in a weightless environment.

But things haven't changed that much, there's still a fuel crisis going on . . . and the present state of the interstellar recession . . . well, who knows where you'll stand one millennia to the next?

The Klingons have put up the price of uranium rods again and here you are stranded on planet with a great stack of the fuel which the known galaxy is crying out for and no easy way to get it on board your ship.

The problem lies in the dreaded anti-matter rods which are mixed in with the uranium, a false move and you could see the whole lot disappear into limbo. If you could just master these paddle controls . . .

The instructions are included with this simulated computer reconstruction of the dilemma. Good loading.

RUNS ON AN ATARI 400 IN 16K

BY MARTIN STIBY

```
0 REM NUMBERS    by Martin Stiby
1 REM WARNING:::::THIS USES PADDLES
10 DIM A$(5):PRINT "}Do you really want
instructions ";:INPUT A$:IF A$(1,1)="N"
THEN 90
15 PRINT " You are collecting up uranium
 rods":PRINT "for your space ship.They a
re to be"
20 PRINT "found in bundles of 1-9, and a
re":PRINT "GREEN in colour.":PRINT " Unf
ortunately, there are anti-matter"
25 PRINT "bundles in the same area.These
 are":PRINT "BLUE, and will obliterate a
n equal"
30 PRINT "number of green rods.":PRINT "
 Your time remaining and score are":PRIN
T "shown at the bottom."
35 PRINT " BE WARNED: Occasionally your
screen":PRINT "will malfunction. Press t
he button on"
40 PRINT "paddle 0 to repair the problem
 !!":PRINT :PRINT "  Paddle 0 is horizon
tal movement"
45 PRINT "  Paddle 1 is vertical movemen
t.":PRINT :PRINT
55 POKE 764,255:PRINT "          any key, pl
ease"
86 IF PEEK(764)=255 THEN 86
90 POKE 764,255:PRINT "CHANGING CHARACTE
R SET - 10 secs."
95 C=5216:FOR A=57440 TO 57856:B=PEEK(A)
:POKE C,B:C=C+1:NEXT A:FOR A=5120 TO 521
5:READ B:POKE A,B:NEXT A
100 GRAPHICS 1:SETCOLOR 0,12,6:SETCOLOR
3,0,14:POKE 752,1:TIME=500:PRINT "TIME
   SCORE"
500 A=1:B=20:C=9:D=33:E=0.5:F=32:G=0.9:H
=756:I=226:K=5:L=0:M=1:P2=11.5:N=138:O=2
0:S=228:SCORE=0:POKE H,O
1000 SOUND 0,50,2,10:X=INT(RND(A)*B):Y=I
NT(RND(A)*B):Z=INT(RND(A)*C):IF RND(A)>E
 THEN Z=Z+128
1010 COLOR Z+D:PLOT X,Y:X=INT(RND(A)*B):
Y=INT(RND(A)*B):COLOR F:PLOT X,Y:IF RND(
A)>G THEN POKE H,I:SOUND 1,10,8,8
1020 SOUND 0,0,0,0:FOR J=A TO K:GOSUB 15
00:SOUND 0,0,0,0:NEXT J:IF TIME=0 THEN 2
000
1030 GOTO 1000
1500 P=S-PADDLE(L):Q=PADDLE(M):P1=INT(P/
P2):Q1=INT(Q/P2):LOCATE P1,Q1,R:IF R=F O
R R=N THEN 1700
1600 R=R-D+1:IF R>C THEN SOUND 0,10,10,1
5:R=R-128:SCORE=SCORE-R:GOTO 1700
1610 SOUND 0,20,10,15:SCORE=SCORE+R
1700 IF N=138 THEN N=139:GOTO 1710
1705 N=138
1710 COLOR F:PLOT P3,Q3:COLOR N:PLOT P1,
Q1:P3=P1:Q3=Q1:IF PTRIG(L)=0 THEN POKE H
,0:SCORE=SCORE-A:SOUND 1,0,0,0
1720 TIME=TIME-A:PRINT TIME,SCORE;"   ":R
ETURN
2000 POKE H,0:SOUND 1,0,0,0:PRINT :PRINT
 :PRINT "WANT ANOTHER BASH ";:INPUT A$:I
F A$(1,1)="Y" THEN 100
2010 GRAPHICS 0:POKE H,224:POKE 752,0:EN
D
4000 DATA 0,0,0,0,0,0,0,0
4001 DATA 0,2,4,8,16,32,64,0
4002 DATA 0,126,0,64,32,16,8,0
4003 DATA 0,126,0,30,112,0,126,0
4004 DATA 0,36,72,18,36,72,18,4
4005 DATA 84,84,84,0,254,0,254,0
4006 DATA 0,82,82,0,42,42,42,0
4007 DATA 220,0,112,0,108,0,238,0
4008 DATA 0,170,170,0,162, 170,138,0
4009 DATA 0,219,0,108,0,170,170,0
4010 DATA 0,24,60,66,66,66,66,0
4011 DATA 0,24,60,66,66,36,24,0
```

CHRISTMAS
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Suddenly a flight of enemy machines shows up on your long range scanner and you head in to attack with your laser cannon. They reply with deadly multi-warhead missiles. You start with two choppers in reserve, and add another for each 10,000 points scored, up to a maximum of six.

RUNS ON AN ATOM IN 12K

```
0REM MONSTER
 1REM MARKUS JAKOBSSON
 2REM ÅLSTORP 5:57
 3REM S-24021 LÖDDEKÖPINGE
 4REM SWEDEN
 5REM
20DIMLL9,M768,L2;P.$21;H=0
30P=#3B10;U=#B002;T=#3B00
35?T=0;T?1=0;T?2=0;T?3=0
40[
50:LL0 LDX@0;LDY@0
60:LL1 LDA(#82),Y;STA(#80,X)
70INY;LDA#80;CLC;ADC@#20;STA#80
80LDA#81;ADC@0;STA#81
90:LL2 CPY@8;BNELL1
```

BY MARCUS JACOBSSON



MONSTER

It is the year 2017. You are the sole survivor of a scientific research mission which came to grief on the recently discovered planet Xirec. Your ship crashed on one of Xirec's many small moons en route to the Andromeda research colony.

You were left behind to guard the ship when your nine fellow astronauts decided to go down to the surface of the planet. They did not return. You discovered that the moon was inhabited by creatures called Gnoofs who at first seemed friendly — but later caught you and transformed you into a monster.

Your only hope is the antedote. This will reverse the transformation and give you a chance to complete repairs to your ship and escape the infested moon.

The only problem is that the antedote is contained in the Gnoofs themselves. You have to eat as many as you can before you will return to human shape. Consuming the Gnoofs is difficult — and there are four types of these unsavoury creatures. The Megonaires, a four legged spider-like being, the Xymers, a rare breed of Gnoof and the best tasting, the Tyrolites, very poisonous and eventually deadly if you eat too many and the Imposarios who are invisible but have the ability to transform into any of the above types of Gnoof.

The best Gnoofs to eat are the Xymers, but they are hard to find, the Megonaires are plentiful but will not speed your transformation a great deal. If you devour more than three Tyrolites — it's goodbye cruel universe. Imposarios are tricky creatures one minute they can look like harmless Megonaires, then they'll suddenly become a poisonous Tyrolite.

Megonaires score one point toward your transformation, Xymers are worth 10. When you reach a multiple of 100 you'll feel better and get a bonus. Instead of using a knife and fork to eat the Gnoofs the controls are '[' for up and '?' for down.

And remember — don't forget the indigestion tablets!

```
100RTS
110:LL3 JSR#FE71;STY#21C;RTS
120:LL4 LDX@0
130:LL5 LDA L;STA U
140AND@#48;ADC@#48;ASLA;ASLA;ROLL+2;ROLL+1;ROLL;INX;BNE LL5
150RTS
160];P.$6
170F.A=0TO768;A?M=0;N.
180!#2800=#F8FC763C;!#2804=#003C7EFC
200!#2808=#FFFF763C;!#280C=#003C7EFF
220F.A=0TO7;A?#2810=0;N.
230!#2818=#10280000;!#281C=#00000028
250!#2820=#38100000;!#2824=#00001010
270!#2828=#7E7E1818;!#282C=#18181818
280!#2830=#7E3C1800;!#2834=#00183C7E
290!#2838=#3C180000;!#283C=#00000018
295GOS.z
300F.A=0TO7;A?#2840=0;N.
310?#2843=#18;?#2844=#18
320?#83=#28;Z=0;F=99;S=0
330GOS.9;CLEAR4
335GOS.h
337GOS.l;GOS.b;?#82=7
338GOS.k
340LI.LL0
```

```
350GOS.d;IFW=1;W=0;?#80=0;CLEAR4;F=99;G.335
360?#82=0;?#81=?#81-1
370LI.LL0
380GOS.c
390?#82=#10
400?#81=?#81-1
410LI.LL0;?#81=?#81-1;?#80=?#80+1;?#82=8;IF?#80>
30;GOS.b
420GOS.a
430G.340
440b?#80=1;?#81=A.R.%8+#89;R.
450E.
460a
470LI.LL3
480IF?#21C=1;?#81=?#81-1;IF?#81<#84;?#81=#84
490IF?#21C=31;?#81=?#81+1;IF?#81>#97;?#81=#97
500?#21C=0
510R.
520cO=?#80;P=?#81
530G=1;?#82=#18
540F.A=1TO2
550C=A.R.%25;D=A.R.%20
```

Illustrations: Dorian Cross

```
560E=C+(D*32);E?M=G;C=C+6
570D=D+#84;?#80=C;?#81=D
580LI.LL0
590IFA.R.%(15-K)<>3;?#82=#20;G=2
591N.
595IFA.R.%10=3;GOS.j
600?#80=O;?#81=P
610R.
620dIFS<99 A. K>2;WAIT;IFK>7;F.A=1TO6;WAIT;N.
630Q=?#80;R=?#81;R=R-#85;Q=Q-6
640A=Q+(R*32);IFA?M=1;A?M=0;S=S+1;GOS.e
650IFA?M=2;A?M=0;Z=Z+1;GOS.f
655IFA?M=3;S=S+10;GOS.i
660R.
670e
680F.A=0TO2;A?L=A.R.%1000;N.;LI.LL4;IFF<S;F=F+100;GOS.m;G.700
690GOS.h
700R.
710f
```





```
720F.A=1TO10;LI.LL4;N.
730?#81=?#81-1
740?#82=#30;LI.LL0
750?#81=?#81-1;F.A=1TO60;WAIT;N.;?#82=#38;LI.LL0;
?#81=?#81-1
760F.A=1TO60;WAIT;N.;?#82=#40;LI.LL0;F.A=1TO40;
WAIT;N.
770?#81=?#81-1;?#82=#10;LI.LL0
780?#81=#81;?#80=#1E-Z
790?#82=#28
800LI.LL0;GOS.b
810IFZ>2;F.A=1TO768;A?M=0;N.;GOS.k;W=1;G.830
820F.A=1TO60;WAIT;N.
830R.
840g
850!#2848=#44444438;!#284C=#38444444
860F.A=0TO7;A?#2850=8;N.;?#2851=#18
870!#2858=#0402423C;!#285C=#7E402018
890!#2860=#0C02423C;!#2864=#3C420202
910!#2868=#40202010;!#286C=#08087C48
930!#2870=#7C40407E;!#2874=#38440202
950!#2878=#38402010;!#287C=#384482C4
970!#2880=#0404027E;!#2884=#10100838
990!#2888=#3C42423C;!#288C=#3C424242
```

```
1000!#2890=#44444438;!#2894=#3008043C
1011!#2898=#38380000;!#289C=#00000038
1020R.
1030hV=S;I=0;O=?#80;P=?#81;?#80=5
1040DO T?I=V%10;V=V/10;I=I+1;U.V=0
1050?#81=#81
1060F.A=0TO3;?#82=(T?A)*8+#48
1065LI.LL0;?#81=?#81-1;?#80=?#80-1;N.
1070?#80=O;?#81=P;R.
1080j
1090C=A.R.%25;D=A.R.%20
1100E=C+(D*32);E?M=3;C=C+6;D=D+#84;?#80=C;?#81=D;?#82=#98
1110LI.LL0;R.
1120iF.A=0TO3;A?L=A.R.%10;LI.LL4;N.;GOS.h;IFS>F;F=F+100;GOS.m
1121R.
1125kIFS>H;H=S
1126GOS.l
1130S=0;F.A=0TO3;A?T=0;N.
1140IFZ>0;Z=0;F.A=1TO30;LI.LL4;N.;LI.#FFE3
1150R.
1160l?#80=#A;V=H;I=0;GOS.1040
1170R.
1180mF.A=1TO20;LI.LL4;WAIT;N.
1185?#81=?#81-1;?#82=#10;LI.LL0
1190?#80=#1B;F.A=1TO3;?#81=#81;LI.LL0;?#80=?#80+1
1195N.;?#80=1;?#81=A.R.%8+#89
1200Z=0;R.
1210zP.$12"              MONSTER"'''"DIFFICULTY 1 HARD"'
1220P."           2 MEDIUM"'
```



```
1230P."           3 EASY"'
1240P."           4 LEARN"'''
1250IN."WHICH LEVEL DO YOU WANT"K
1260IFK>4OR K<1;P.$11;LI.#FE22;G.1250
1265K=K*2
1270R.
```



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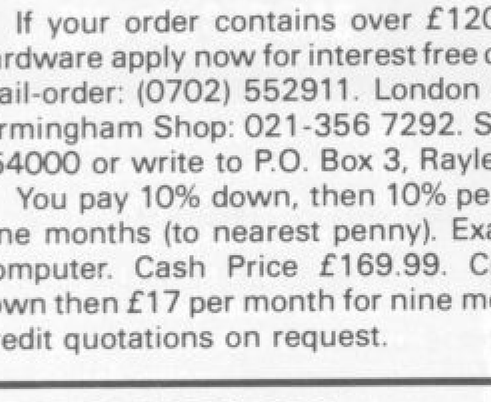
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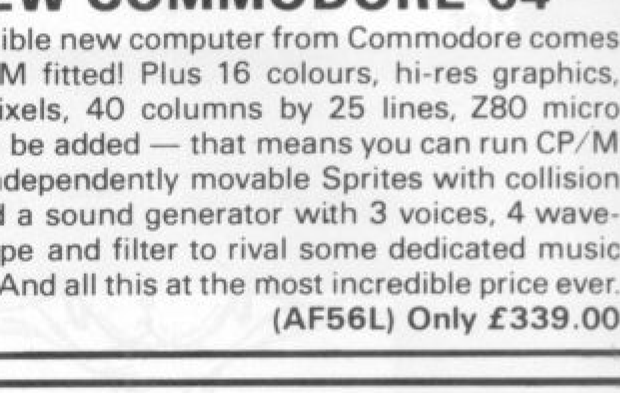
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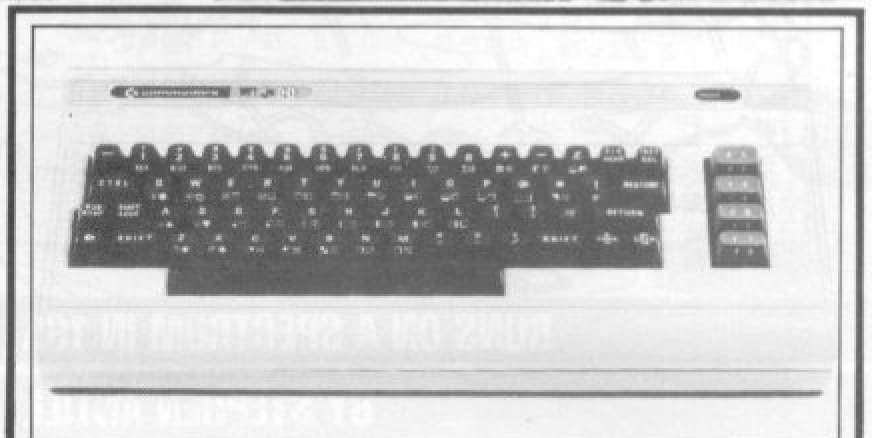
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FROGGER



Illustration: Terry Rogers

RUNS ON A SPECTRUM IN 16K

BY STEPHEN ANTILL

Ribbit! Ribbit! Hi there, I'm Hopalong Green, your guide on this tour through the swamps and pools of Frogville. I'm here to show you how my little green buddies survive in this fast moving world of ours.

As you may know many of us frogs have to commute between our homes in the soggy swamplands and the feeding grounds. Unfortunately there's a fast flowing river and a two lane highway in between. This makes commuting considerably more difficult than just catching the 8.10 to Paddington. With a hop, skip and a jump the merry band of webbed wonders brave the dangers of road and river.

They have to go it alone when crossing the road, but there are friendly turtles in the river who will lend a hand — or more correctly a shell — to see the frogs safely on their way.

They also hitch a lift on useful barrels which float down river from the local brewery. Many a frog has arrived home late with a lopsided hop and a silly grin on its face after staying too long on a barrel.

Now you too can experience the daily frog-rush. Simply plug in your Spectrum and program in this listing.

Just like the real thing the rush is split into two halves. First you must cross the road — which has four lanes of fast moving traffic, then comes the river and the turtles. The frogs simply have to get to the safety of the riverbank. To start with it's fairly easy — but it gets harder as the rush progresses.

By the way, there are 17 difficulty levels, and the frogs are moved by using the Z key for left, X for right, M for up and N for down.

You get three lives for each rush hour and there are 17 difficulty levels.

OK, frog lovers, now it's all up to you. Hop to it!

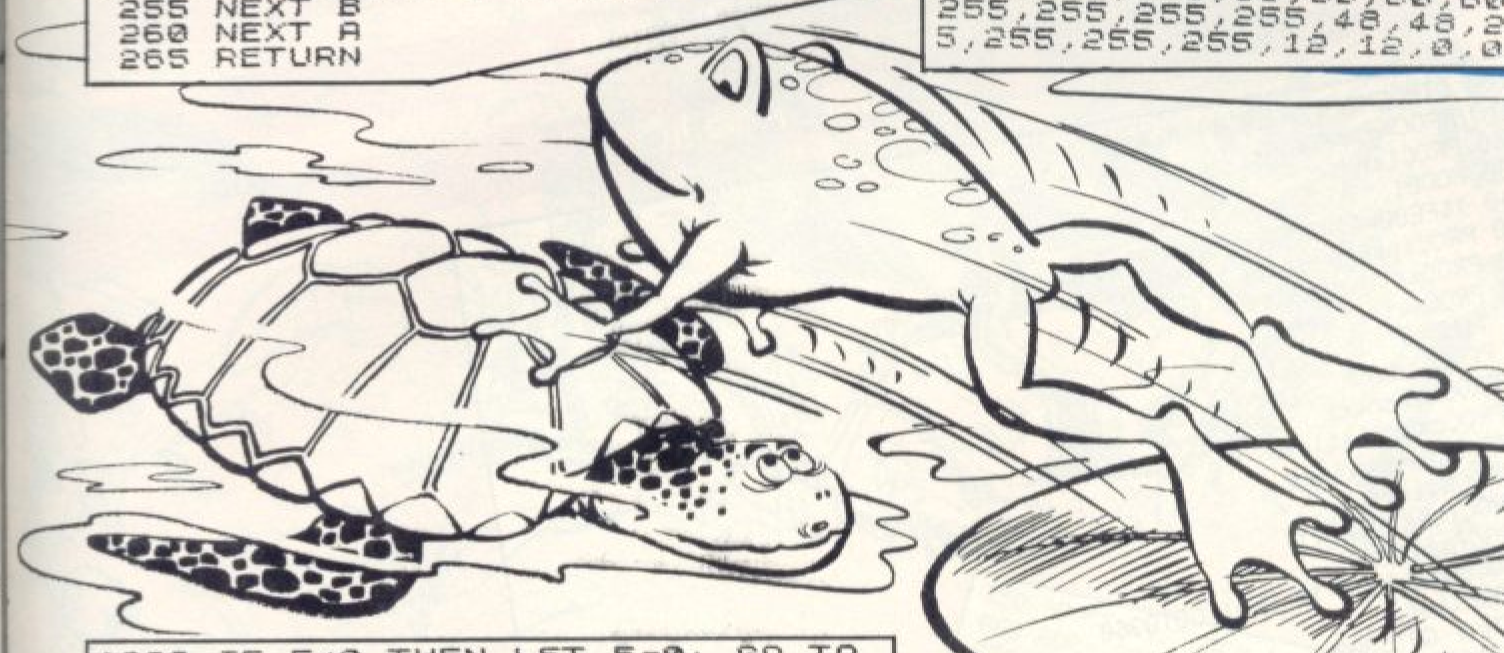
The main variables are;

TS	Top score
S	Your score
FL	Number of frogs left
R	Round number
A$(4,64)	Stores car or turtle/barrel positions
X$, Y$(4,128)	To print the lanes of cars/turtles/barrels
A,B,C,W	General use
F,F1	Frog screen coordinates
G,G1,G2	Used to check move
P	Paper colour
T	Time left

```
  1 BORDER 0: PAPER 0: RANDOMIZE : CLS : REM 1982, S. Antill
  2 LET TS=0: GO SUB 7000
  3 PRINT INK 3;AT 3,0;"[graphics]", INK 4;"[graphics]", INK 5;"[graphics]", INK 6;"[graphics]", INK 7;"[graphics]", INK 2;"[graphics]"
  4 LET S=0: LET FL=3
 10 LET R=1
 11 GO TO 3000
 15 DIM A$(4,64): DIM X$(4,128): DIM Y$(4,128)
 16 FOR A=1 TO 4
 20 FOR B=1 TO 3*R
 25 LET C=INT (RND*46)+1
 30 LET A$(A,C)="1"
 35 IF C<17 THEN LET A$(A,48+C)="1"
 40 NEXT B
 45 FOR B=1 TO 64
 50 IF A$(A,B)=" " THEN GO TO 70
 55 IF A/2=INT (A/2) THEN GO TO 65
 60 LET X$(A,B*2-1 TO B*2)="[graphics]": LET Y$(A,B*2-1 TO B*2)="[graphics]": GO TO 70
 65 LET X$(A,B*2-1 TO B*2)="[graphics]": LET Y$(A,B*2-1 TO B*2)="[graphics]"
 70 NEXT B
 75 NEXT A
 76 RETURN
 80 CLS : FOR A=1 TO 96: PRINT INK 6; PAPER 4;"~";: NEXT A
 85 FOR A=1 TO 16: PRINT PAPER P;"  ": NEXT A
 90 FOR A=1 TO 96: PRINT PAPER 4; INK 6;"~";: NEXT A
 95 PRINT INK 7;AT 0,0;"FROGGER: ";R,"TOP=";TS,;AT 21,0;"SCORE=";S,"TIME="
100 LET F1=19: LET F=16: LET T=105-R*5
105 FOR B=1 TO 96
107 PRINT INK 7;AT 21,21;T;" "
110 FOR A=1 TO 3 STEP 2
111 IF P=1 AND F1=A*4 THEN LET F=F-1
115 PRINT INK A+1; PAPER P;AT A*4,0;X$(A,B TO B+31);AT A*4+1,0;Y$(A,B TO B+31)
120 NEXT A
125 GO SUB 1000
130 FOR A=2 TO 4 STEP 2
131 IF P=1 AND F1=A*4 THEN LET F=F+1
135 PRINT INK A+1; PAPER P;AT A*4,0;X$(A,97-B TO 128-B);AT A*4+
```

```
1,0;Y$(A,97-B TO 128-B)
 140 NEXT A
 145 GO SUB 1000
 147 LET T=T-1: IF T<=0 THEN GO
TO 8000
 150 NEXT B
 155 GO TO 105
 200 DIM A$(4,64): DIM X$(4,128)
 DIM Y$(4,128)
 201 FOR A=1 TO 4
 205 FOR B=1 TO 60-3*R
 210 LET C=INT (RND*46)+1
 215 LET A$(A,C)="1"
 220 IF C<17 THEN LET A$(A,48+C)
="1"
 225 NEXT B
 230 FOR B=1 TO 64
 235 IF A$(A,B)=" " THEN GO TO 2
55
 240 IF A/2=INT (A/2) THEN GO TO
 250
 245 LET X$(A,B*2-1 TO B*2)="■■"
: LET Y$(A,B*2-1 TO B*2)="■■": G
O TO 255
 250 LET X$(A,B*2-1 TO B*2)="■■"
: LET Y$(A,B*2-1 TO B*2)="■■"
 255 NEXT B
 260 NEXT A
 265 RETURN
```

```
3000 GO SUB 15
3001 LET P=7
3005 GO TO 80
3010 GO SUB 200
3011 LET P=1
3020 GO TO 80
3025 LET R=R+1: IF R>17 THEN LET
 R=17
3030 GO TO 3000
5000 PRINT AT 1,F; INK 4; PAPER
0; FLASH 1;"■■";AT 2,F;"■■": PRI
NT PAPER P; INK 2;AT 4,0;X$(1,B
TO B+31);AT 5,0;Y$(1,B TO B+31);
 INK 3;AT 8,0;X$(2,97-B TO 128-B
);AT 9,0;Y$(2,97-B TO 128-B)
5001 BEEP 0.1,9: BEEP 0.1,5: BEE
P 0.1,5: BEEP 0.2,5: PAUSE 5: BE
EP 0.1,9: BEEP 0.1,5: BEEP 0.1,5
: BEEP 0.2,5: BEEP 0.1,5: BEEP 0
.2,7: BEEP 0.1,7: BEEP 0.1,12: B
EEP 0.1,12: BEEP 0.1,12: BEEP 0.
2,9: BEEP 0.1,5: BEEP 0.2,5
5005 LET S=S+1
5010 IF P=1 THEN GO TO 3025
5015 GO TO 3010
7000 DATA 0,0,15,15,12,12,12,12,
0,0,240,240,60,60,60,60,255,255,
255,255,255,255,48,48,255,255,25
5,255,255,255,12,12,0,0,15,15,60
```



```
1000 IF F<0 THEN LET F=0: GO TO
8000
1001 IF F>30 THEN LET F=30: GO T
O 8000
1002 PRINT PAPER P;AT F1,F;"  ";
AT F1+1,F;"  "
1005 IF F1=19 THEN PRINT PAPER 4
; INK 6;AT F1,F;"^^";AT F1+1,F;"
^^"
1010 LET F$=INKEY$
1015 IF F1=19 THEN GO TO 1100
1020 LET G=F1/4
1025 IF G=1 OR G=3 THEN GO TO 10
50
1030 LET G1=98-B+F
1031 LET G2=99-B+F
1035 GO TO 1055
1050 LET G1=B+F+1
1051 LET G2=B+F
1055 LET G1=INT ((G1/2)+0.5)
1056 LET G2=INT ((G2/2)+0.5)
1060 IF A$(G,G1)="1" AND P=7 THE
N GO TO 8000
1061 IF A$(G,G2)="1" AND P=7 THE
N GO TO 8000
1065 IF A$(G,G1)=" " AND P=1 THE
N GO TO 8000
1100 IF F$="m" THEN LET F1=F1-4:
 IF F1=15 THEN LET F1=16
1105 IF F$="n" THEN LET F1=F1+4:
 IF F1>=20 THEN LET F1=19
1110 IF F$="z" THEN LET F=F-4
1115 IF F$="x" THEN LET F=F+4
1120 IF F<0 THEN LET F=F+4
1125 IF F>30 THEN LET F=F-4
1126 IF F$<>"" THEN BEEP 0.003,1
: BEEP 0.003,2: BEEP 0.003,3: BE
EP 0.003,4
1130 IF F1=0 THEN GO TO 5000
1135 PRINT INK 4; PAPER P;AT F1,
F;"■■";AT F1+1,F;"■■"
1140 RETURN
1200 RETURN
```

```
,60,60,60,0,0,240,240,48,48,48,4
8,12,12,3,3,15,15,227,243,12,12,
240,240,252,252,255,255,243,227,
15,15,3,3,12,12,255,255,252,252,
240,240,12,12,15,31,31,63,63,127
,127,127,127,127,127,63,63,31,31
,15,131,195,195,193,251,255,15,1
5,193,195,195,131,223,255,240,24
0,15,15,79,127,223,199,192,192,2
40,240,242,254,251,243,3,3,240,2
48,248,252,252,254,254,254,254,2
54,254,252,252,248,248,240
7005 FOR A=144 TO 161: FOR B=0
TO 7: READ C: POKE USR CHR$ (A) + B,
,C: NEXT B: NEXT A
7010 RETURN
8000 PRINT INK 7; PAPER 0; FLASH
 1;AT F1,F;"■■";AT F1+1,F;"■■":
FOR W=0 TO -10 STEP -2.5
8001 BEEP 0.2,W: BEEP 0.2,W: BEE
P 0.2,W
8002 NEXT W
8003 BEEP 1.2,-15
8005 LET FL=FL-1
8010 IF FL=0 THEN GO TO 9500
8020 GO TO 80
9500 PRINT FLASH 1; INK 7; PAPER
 0;AT 1,10;"GAME OVER"
9505 FOR A=5 TO -50 STEP -0.5: B
EEP 0.05,A: NEXT A
9510 IF S>TS THEN LET TS=S
9515 FOR W=1 TO 500: NEXT W
9520 CLS : GO TO 3
```



```
10 REM  --- SUPER LANDER! ---
20 REM
30 REM
40 REM [ Written by P.Nicholls.
01-08-82. ]
50 REM
60 REM
70 REM ### COPY ME!!
I WANT TO TRAVEL!! ###
80 REM
90 REM
```

RUNS ON A BBC MODEL B

OR EXPANDED MODEL A

BY PHILLIP NICHOLLS

```
100 DIMLEM$(4),ME$(4),ML$(9)
110 PROCmessage
120 PROClander
130 MODE1
140 !&FE00=&10200A
150 PROCinstructions
160 PROCsetvariables
170 PROCsetscreen
180 TIME=0
190 PROCupdate
200 PROCkeycheck
210 PROCcalculations
220 PROCcheckvalues
230 PROCnoises
240 PROClemstring
250 PROCfuel
260 PROCcheckland:IF OK=1:GOTO360
270 PROChitote
280 IFCH=1:GOTO300
290 GOTO190
300 SOUND1,0,0,0
310 FORI=1 TO 180:MOVESH,SV:GCOLRND(5)-1,RND(4)-1
320    DRAWSH+RND(300)-150,SV+RND(300)-150
330    SOUND0,-12+(I/15),RND(3)+3,1
340    VDU19,RND(4)-1,RND(8)-1,0,0,0:NEXT
350 M$=ME$(ABS(VV) MOD 5):GOTO450
360 IF VV<-10 OR AN<>0 GOTO 300
370 RESTORE:FORI=1 TO 22
380    READM1,M2
390    SOUND1,-8,M1+48,M2*3:SOUND2,-5,M1+96,M2*3:SOUND3,-4,M1+144,M2*3
400    SOUND&1001,0,0,0
410    NEXT
420 DATA 20,1,20,2,40,1,60,1,40,1,60,1,40,1,30,1,30,2,50,1,70,4
430 DATA 80,1,60,1,40,1,80,1,60,1,40,1,60,1,80,1,100,2,80,1,100,6
```

SUPER LANDER

```
440 M$=ML$(ABS(VV) MOD 10)
450 NOW=TIME:REPEAT UNTILTIME=NOW+300
460 VDU20,19,1,4,0,0,0:COLOUR129:CLS
470 *FX15,0
480  PRINTTAB(6,10);"THAT WAS ";M$;"!"
490 PRINT'''"      WOULD YOU LIKE ANOTHER GO?"
500 R$=GET$:IFR$<>"Y":CLS:!&FE00=&10670A:END
510 GOTO160
520 END
525
530 DEF PROCkeycheck
540 IF INKEY(SPACE) T=T+800
550 IF INKEY(ROL) AN=AN-1
560 IF INKEY(ROR) AN=AN+1
570 IF INKEY(ABORT) AN=0:AB=1
```



Illustration: Dorian Cross



```
580 ENDPROC
585
590 DEF PROClander
600 VDU23,224,128,64,60,36,36,60,64,128
610 VDU23,225,0,0,24,36,228,24,8,8
620 VDU23,226,0,0,60,36,36,60,66,129
630 VDU23,227,0,0,24,36,39,24,8,8
640 VDU23,228,1,2,60,36,36,60,2,1
650 FORI=0 TO 4
660    LEM$(I)=CHR$(224+I)
670    NEXT
680 ENVELOPE1,10,20,-20,20,1,2,1,100,0,0,0,50,0
690 ENDPROC
695
700 DEF PROCsetvariables
710 M=1250:REM mass in kgs.
720 AV=0:REM vertical acceleration
730 AH=0:REM horiz. acceleration
740 SV=1000:REM Y coord of lander
750 SH=64:REM X coord of lander
760 VV=0:REM vertical velocity
770 VH=0:REM horiz. velocity
780 T=0:REM total thrust
790 TV=0:REM vertical thrust
800 TH=0:REM horiz thrust
810 FU=8000:REM fuel left
820 G=3.4:REM gravity
830 TIME=0:REM zero time
840 AN=0:REM angle of rot./45deg.
```

```
850 SPACE=-227:REM 'INKEY' space code
860 ROR=-201:REM 'INKEY' colon code
870 ROL=-216:REM 'INKEY' ';' code
680 BAP=(285-RND(250))*4:REM base pos.
890 OL$="":REM old lander
900 NL$="":REM new lander
910 N=0:REM fuel warning flag
920 ABORT=-194:REM 'INKEY' A code
930 AB=0:REM abort flag
940 ENDPROC
945
950 DEF PROCcalculations
960 TV=T*COSRAD(45*AN)
```

```
970 TH=T*SINRAD(45*AN)
980 FU=FU-T/400
990 MT=M+FU/10
1000 AV=(TV-MT*G)/MT
1010 AH=TH/MT
1020 TI=TIME/100
1030 SY=VV*TI+0.5*AV*TI*TI
1040 SX=VH*TI+0.5*AH*TI*TI
1050 VV=VV+AV*TI
1060 VH=VH+AH*TI
1070 TIME=0
1080 T=T-350
1090 ENDPROC
1095
1100 DEF PROCcheckvalues
1110 IF T>9000 AND AB=0 T=9000
1120 IF T<0 T=0
1130 IF AN<-2 AN=-2
1140 IF AN>2 AN=2
1150 IF FU<0 FU=0
1160 IF FU=0 T=0
1170 IF FU>0 AND AB=1 T=15000
1180 IF AB=1 AND VV>6 AB=0
```

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```
1190 ENDPROC
1195
1200 DEF PROCnoises
1210 IF FU>0 SOUND&10,-T/1100-1,6,7
1220 ENDPROC
1225
1230 DEF PROChitote
1240 CH=0:FOR C=0 TO 28 STEP 4
1250   H=POINT(SH+C,SV-32):IF H=2 OR H=-1:CH=1
1260   NEXT
1270 ENDPROC
1275
1280 DEF PROCcheckland
1290 OK=0
1300 IF SH>=BAP:IF SH<=BAP+40:IF SV<=328:OK=1
1310 ENDPROC
1315
1320 DEF PROCsetscreen
1330 COLOUR128:CLS:VDU20,19,0,4,0,0,0
1340 GCOL0,1:FORI=1 TO 150:PLOT69,RND(1280),RND(734)+290:NEXT
1350 H=350
1360 FOR I=0 TO 1280 STEP 4
1370   P=RND(48)-24:GCOL0,3
1380   IF P+H<292 OR P+H>600:P=-P
1390   H=H+P:MOVE I,256:DRAW I,H-24:GCOL0,2:DRAWI,H
1400   IF I>=BAP-12:IF I<=BAP+52:DRAWI,260
1410   NEXT:GCOL0,0
1420 MOVE BAP,260:MOVE BAP,610:PLOT 85,BAP+40,260:PLOT85,BAP+40,610
1430 GCOL0,1
1440 MOVE BAP,260:MOVE BAP,292:PLOT 85,BAP+40,260:PLOT85,BAP+40,292
1450 PRINTTAB(1,25);"V.VEL.                H.VEL."'''
1455 REM *** 16 SPACES IN ABOVE LINE ***
1460 PRINTTAB(1);"FUEL.                 THRUST."
1465 REM *** 17 SPACES IN ABOVE LINE ***
1470 GCOL3,3:ENDPROC
1475
1480 DEF PROCupdate
1490 PRINTTAB(2,26);INT(VV*10)/10;"     ";TAB(24,26);INT(VH*10)/10;"    "
1500 VDU-17*(FU<1500),-129*(FU<1500)
1510 PRINTTAB(2,30);INT(FU);CHR$(17);CHR$(128);"   ";TAB(24,30);INT(T);"     "
1520 ENDPROC
1525
1530 DEF PROClemstring
1540 OL$=NL$
1550 NL$=LEM$(2-AN)
1560 VDU5:MOVESH,SV:PRINTOL$
1570 MOVESH+SX,SV+SY:PRINTNL$
1580 VDU4:SH=SH+SX:SV=SV+SY:!&FE00=&10200A
1590 ENDPROC
1595
1600 DEF PROCfuel
1610 IF FU>1500 OR N=1 ENDPROC
1620 SOUND1,1,130,10:N=1:ENDPROC
1625
1630 DEF PROCmessage
1640 RESTORE 1680
1650 FORI=0 TO 4:READ ME$(I):NEXT
1660 FORI=0 TO 9:READ ML$(I):NEXT
1670 ENDPROC
1675
1680 DATA "TERRIBLE","AWFUL","RUBBISH","UUUUUUGH!","DREADFUL!"
1690 DATA "EXCELLENT","BRILLIANT","VERY GOOD","PRETTY GOOD","AVERAGE"
1700 DATA "NOT BAD","BUMPY","ROUGH","A CLOSE SHAVE","A DEFINITE FLUKE!"
1705
1710 DEF PROCinstructions
1720 VDU19,0,4,0,0,0
1730 PRINTTAB(10,2);"SUPER LANDER!!";TAB(10,3);"~~~~~~~~~~~~~~"
1740 PRINT'''TAB(5);"CONTROLS :"
1750 PRINT'TAB(5);"':'        ROTATE RIGHT"
1760 PRINT'TAB(5);"';'        ROTATE LEFT"
1770 PRINT'TAB(5);"'SPACE'    THRUST"
1780 COLOUR2
1790 PRINT''TAB(5);"'A'            ABORT!!"
1800 PRINT'''TAB(9);"V.VEL < 10 TO LAND.";''TAB(10);"ARE YOU READY?"
1810 *FX15,0
1820 R$=GET$:IFR$<>"Y" GOTO 1820
1830 RESTORE 420:FORI=1 TO 22:READM1,M2
1840   SOUND1,-8,M1+48,M2*2:SOUND2,-5,M1+96,M2*2:SOUND3,-4,M1+144,M2*2
1850   SOUND&1001,0,0,0:NEXT
1860 ENDPROC
```

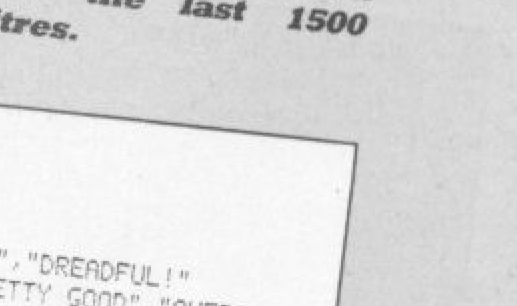
A giant exploration ship orbits a mysterious planet. You are the pilot of a small lander. Your mission is to ferry an exploration party down to the planet's surface. It's a difficult task. No-one knows what you might find below the cloud cover which shrouds the planet. It's all up to you. . . .

The program makes full use of the BBC micro's graphics sound capabilities. When you rotate the craft the machine actually shows this happening, and when you increase thrust you can hear the roar of the engines.

Other warnings and effects include a low fuel audible and visual warning, a spectacular crash and explosion effect when you fail in your mission.

To move the ship, rotate it in the direction that you want to move and apply thrust. These functions are accomplished by using the following keys. ';' rotates craft 45 degrees left. ':' rotates craft 45 degrees right. 'Space' applies thrust in direction that craft is pointing.

If you get into trouble on the way down you can temporarily abort the mission by pressing the 'A' key. This will have the effect of igniting the booster rockets until your vertical velocity exceeds 5 m/s.



The fuel warning system will come into operation as soon as your fuel supply runs down to the last 1500 litres.

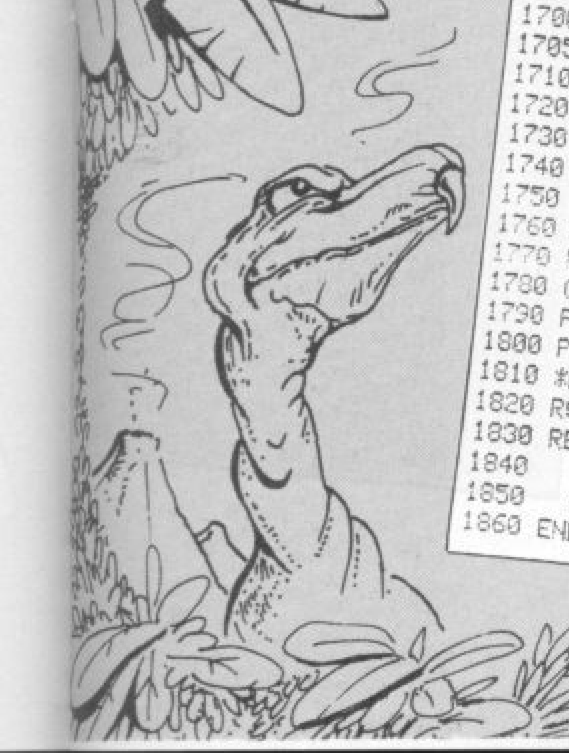


Illustration: Dorian Cross

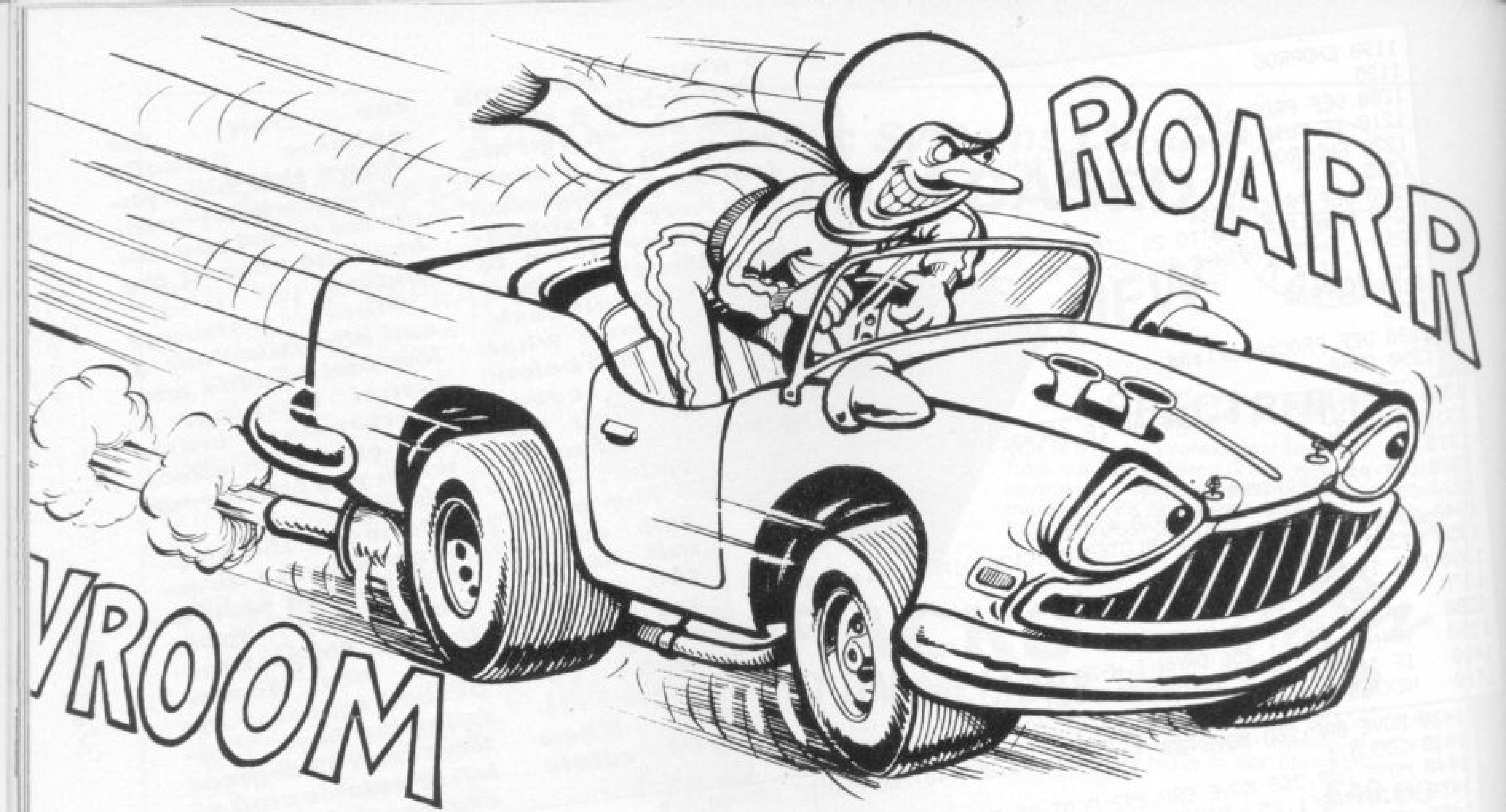


Illustration: Terry Rogers

Bump

RUNS ON A SHARP MZ-80K IN 4K

Kerrunch! Skerrape! Ouch! Driving your Sharpmobile can be a tough business. Your only aim is to keep bumping the computer controlled car — before it bumps you!

You score a point for each contact with the computer's car. But you must avoid the unwary pedestrians who cross you path. If you hit one the computer gets a point. It also scores if the computer car hits your much dented vehicle.

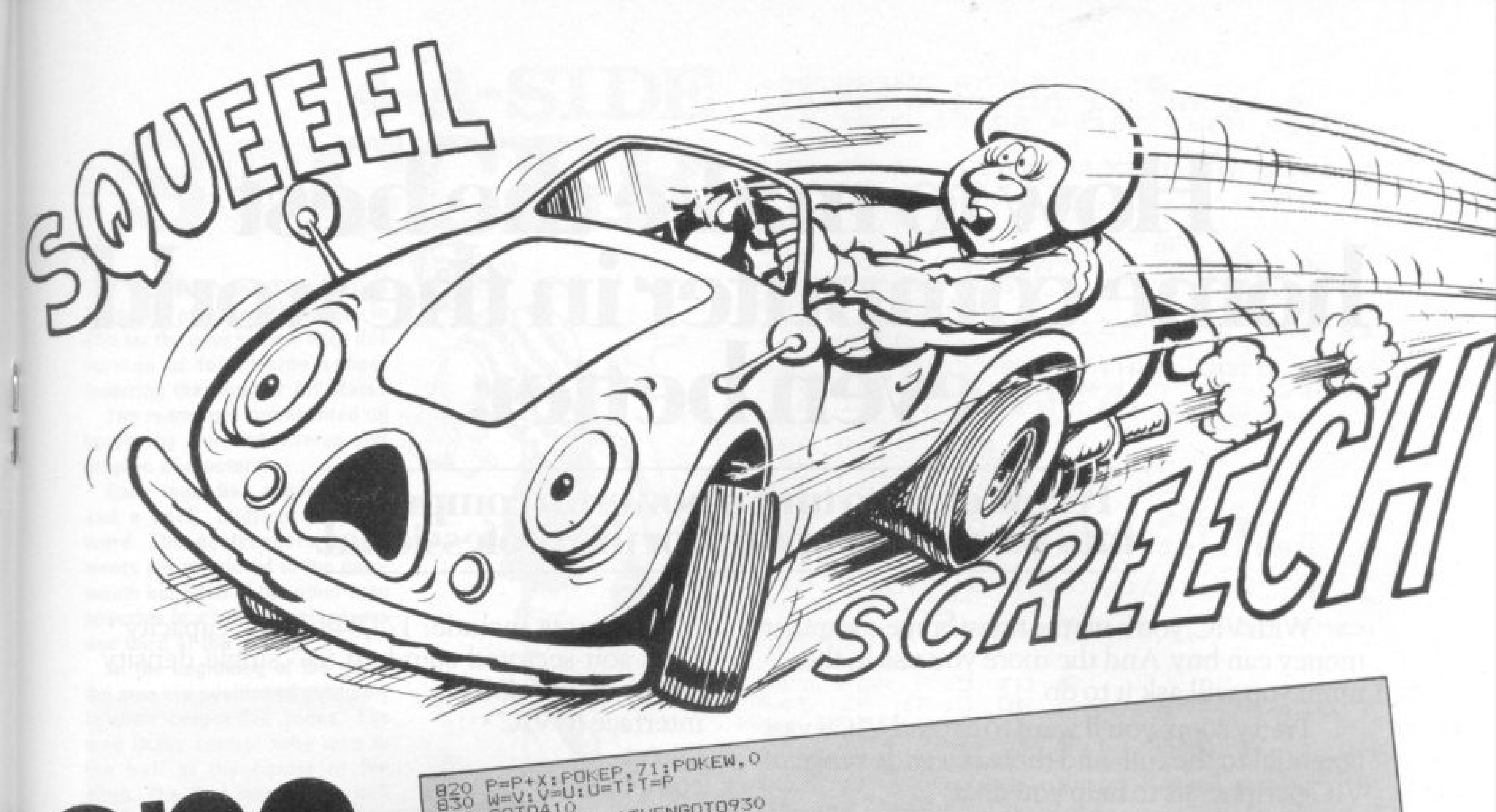
You can select the speed of the cars and the number of pedestrians at the start of each game. The score and time are displayed throughout the game.

Be warned, the computer's car is difficult to catch!

BY FRANK ROONEY

```
10 REM ***   B U M P E R S  ***
20 REM *** F.R. ROONEY 1982 ***
30 GOSUB1170
40 R=208:E1=32:D1=32:X=1
50 PRINT"■"
60 FORI=53248TO53287:POKEI,R:NEXT
70 FORI=53327TO54207STEP40:POKEI,R:NEXT
80 FORI=54247TO54208STEP-1:POKEI,R:NEXT
90 FORI=54168TO53288STEP-40:POKEI,R:NEXT
100 FORI=53378TO53397:POKEI,R:NEXT
110 FORI=53437TO53597STEP40:POKEI,R:NEXT
120 FORI=53637TO53618STEP-1:POKEI,R:NEXT
130 FORI=53578TO53418STEP-40:POKEI,R:NEXT
140 FORA1=53460TO53463
150 READB1
160 DATA25,15,21,43
170 POKEA1,B1
180 NEXTA1
190 POKE53464,E1
200 FORA1=53470TO53472
210 READB1
220 DATA13,5,43
230 POKEA1,B1
240 NEXTA1
250 POKE53473,D1
260 FORA1=53547TO53551
270 READB1
280 DATA19,5,3,19,46
290 POKEA1,B1
300 NEXTA1
310 RESTORE
320 FORK=53610TO54130STEP80
330 FORL=1TOL1
340 B1=INT(35*RND(2))
```

```
350 IFK+B1>53617THENIFK+B1<53638THENGOTO
360 POKEK+B1,202
370 NEXTL
380 NEXTK
390 A=53748:Y=1
400 P=53330:W=53760:TI$="000000"
410 GOSUB850
420 U1=PEEK(A+C1)
430 IFU1<>RTHEN450
440 GOTO460
450 IFU1<>202THENGOTO530
460 IFC1=1THENC1=40:GOTO500
470 IFC1=40THENC1=-1:GOTO500
480 IFC1=-1THENC1=-40:GOTO500
490 IFC1=-40THENC1=1
500 U1=PEEK(A+C1)
510 IFU1=RTHENGOTO460
520 IFU1=202THENGOTO460
530 A=A+C1
540 IFPEEK(A)=71THENMUSIC"_C5":GOT
550 IFPEEK(A)=72THENA=A-C1:Y=5:GOT
560 POKEA,72
570 POKEH,240
580 H=G:G=F:F=E:E=A
590 FORY1=1TOS2:NEXTY1
600 Z=VAL(TI$)
610 IFZ<10THENPRINT"■■■■■■■■";TAB
620 PRINT"■■■■■■■■";TAB(15);Z
630 IFZ=31THENMUSIC"C0_B_#A_A_#G_
640 GETG$
650 IFG$="W"THENX=-40:GOTO690
660 IFG$="X"THENX=40:GOTO690
670 IFG$="A"THENX=-1:GOTO690
680 IFG$="D"THENX=1
690 IFPEEK(P+X)<>RTHENGOTO790
700 IFX=1THENX=-40:GOTO740
710 IFX=40THENX=1:GOTO740
720 IFX=-40THENX=-1:GOTO740
730 IFX=-1THENX=40
740 IFPEEK(P+X)<>RTHENGOTO790
750 IFX=1THENX=-40:GOTO790
760 IFX=40THENX=1:GOTO790
770 IFX=-40THENX=-1:GOTO790
780 IFX=-1THENX=40
790 IFPEEK(P+X)=72THENMUSIC"C5
800 IFPEEK(P+X)=202THENMUSIC"C5
810 IFPEEK(P+X)=71THENW1=W:W=
```



pers

```
ENGOT070

GOTO'READY
GOTO5

TAB(1:Z:GOTO630
#G_G_F_F_E_#D_D_#C_C":GOTO1150

"C5":GOTO1050:REM Y HIT
"C5":GOTO1120
=T:V1=V:V=U:U=V1:T=W1:P=W1:GOTO410
```

```
820 P=P+X:POKEP,71:POKEW,0
830 W=V:V=U:U=T:T=P
840 GOTO410
850 Y=Y+1:IFY<6THENGOTO930
860 L=C
870 C1=INT(4*RND(5)+1)
880 IFC1=2THENC1=40
890 IFC1=3THENC1=-1
900 IFC1=4THENC1=-40
910 IFL=-C1THENGOTO870
920 Y=1
930 RETURN
940 P$="      MY HIT!":GOSUB1530
950 GOTO1130
960 P$="   HARD LUCK, I WIN. ":GOSUB1530
970 FORI=1TO2000:NEXT
980 P$="TO TRY AGAIN, PRESS ANY KEY.":GOSUB1530
990 GETA$:IFA$=""THEN990
1000 IFA$="X"THEN990
1010 IFA$="A"THEN990
1020 IFA$="D"THEN990
1030 IFA$="W"THEN990
1040 GOTO40
1050 P$="     YOUR HIT!":GOSUB1530
1060 E1=E1+1:IFE1=42THENGOTO1080
1070 GOTO50
1080 P$="   WELL DONE, YOU WIN.":GOSUB1530
1090 FORI=1TO2000:NEXT
1100 P$=" TO RESTART, PRESS ANY KEY.":GOSUB1530
1110 GOTO990
1120 P$="  YOU HIT A PEDESTRIAN!":GOSUB1530
1130 D1=D1+1:IFD1=42THEN960
1140 GOTO50
1150 P$="    TIME UP!":GOSUB1530
1160 GOTO1130
1170 PRINT"■■■■■         **   BUMPERS    **"
1180 PRINT"                     ======="
1190 M1$="¯BO¯#A¯A¯#G¯G¯#F¯F¯E¯#D¯D¯#C¯C"
1200 M2$="BO¯C¯#C¯D¯#D¯E¯F¯#F¯G¯#G¯A¯#A¯B¯"
1210 TEMPO4:MUSICM1$:M2$
1220 PRINT"■■■■■■■Do you require instructions? (Y or N)"
1230 GETA$:IFA$=""THEN1230
1240 IFA$="N"THEN1380
1250 PRINT"■Mine is the black car, yours is the     white car."
1260 PRINT"■The first to get 10 points wins."
1270 PRINT"■If you hit me, you get a point."
1280 PRINT"If I hit you, I get the point."
1290 PRINT"■Avoid head-on crashes, you may lose the point!"
1300 PRINT"■If you hit a pedestrian you lose the     point."
1310 PRINT"■Steer by pressing 'X'(DOWN), 'W'(UP),     'A'(LEFT), 'D'(RIGHT)."
1320 PRINT"■If you give no instruction, your car"
1330 PRINT"will turn left at the edges."
1340 PRINT"■You have a time limit of 30 sec. for     each point."
1350 PRINT"■Press any key to continue..."
1360 GETA$:IFA$=""THEN1360
1370 PRINT"■■■■■■■■■■■■Press S for a SLOW game"

1390 PRINT"■■■■■■■■Press F for a FAST game"
1400 GETA$:IFA$=""THEN1400
1410 IFA$="S"THENS2=50:GOTO1440
1420 IFA$="F"THENS2=1:GOTO1440
1430 GOTO1400
1440 PRINT"■■■■■■■■■■■Press N for a NORMAL game"
1450 PRINT"■■■■■■■■Press H for a HARDER game"
1460 PRINT"■■■■■■■■Press D for a DIFFICULT game"
1470 GETA$:IFA$=""THEN1470
1480 IFA$="N"THENL1=4:GOTO1520
1490 IFA$="H"THENL1=6:GOTO1520
1500 IFA$="D"THENL1=8:GOTO1520
1510 GOTO1470                              "
1520 RETURN                                "
1530 PRINT"■
1540 PRINT"■■";P$
1550 PRINT"■
1560 FORI=1TO1000:NEXT
1570 RETURN
```

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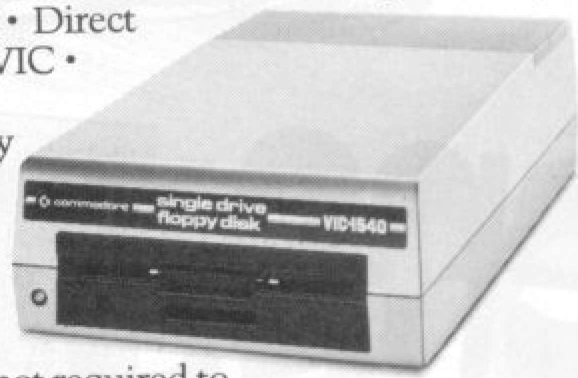
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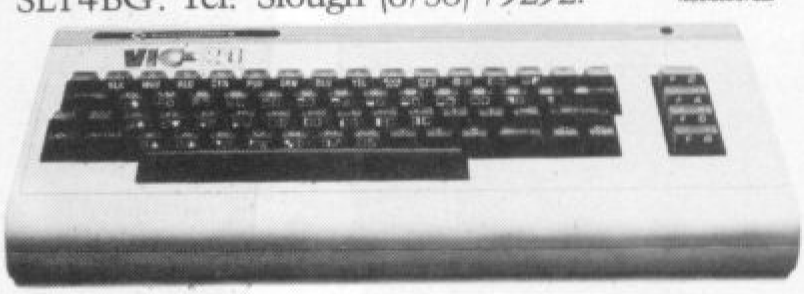
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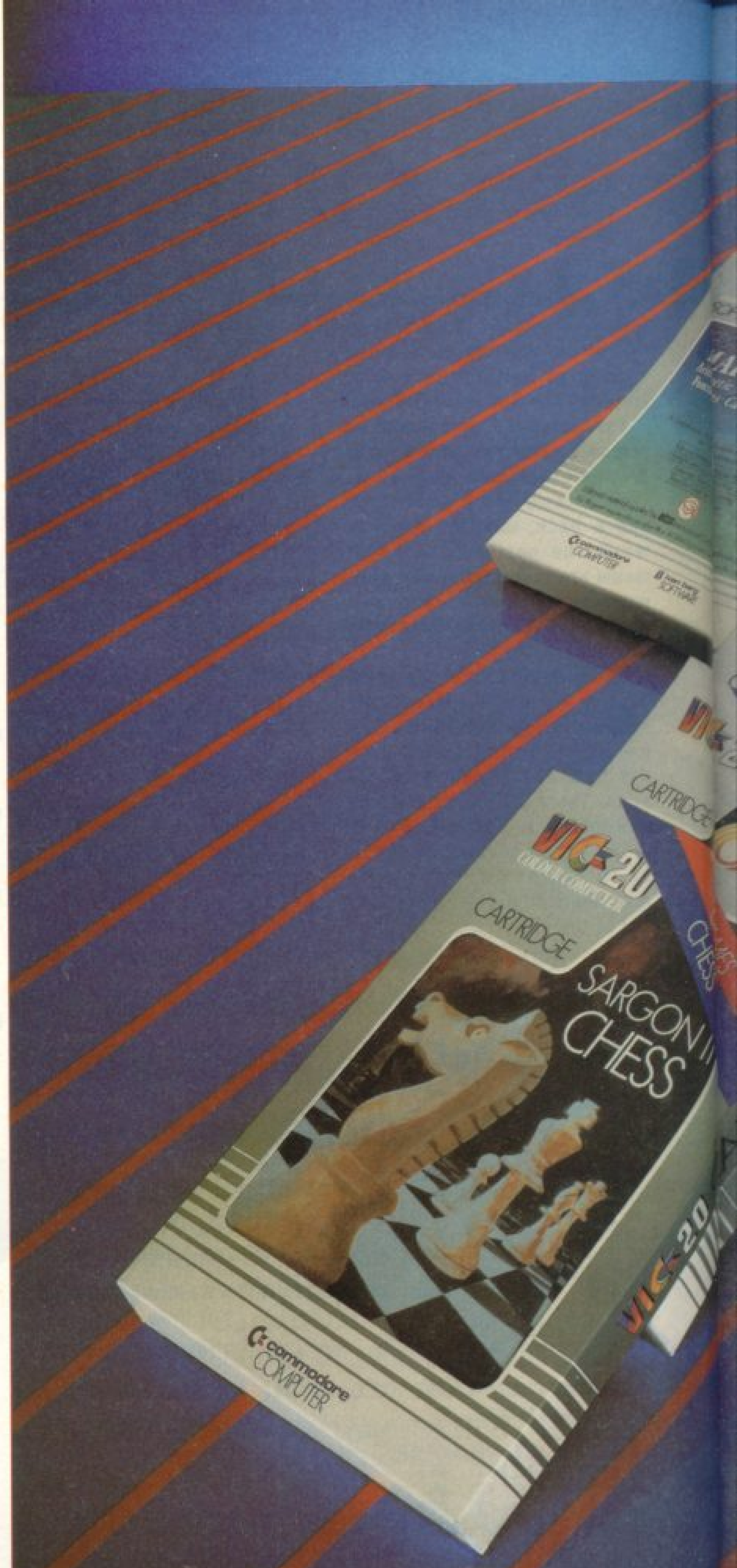
The teams are represented on screen by star and inverse star graphic characters.

Each team has a goalkeeper and a back, midfield and forward. The goalkeeper's movements are restricted to the goalmouth but each of the other men operates in a zone which covers one third of the pitch.

At the beginning of the game the men are positioned randomly in their respective zones. The men in the central zone race to the ball at the centre of the pitch. The first man to the ball has control. A display on line 21 at the bottom of the screen will be in normal print or inverse print depending on who has control of the ball.

```
   1 REM ▒▒Y▒NOT NOT NOT NOT (IF TAN
  10 REM 4-A-SIDE FOOTBALL
  15 REM (C) B.HORSFIELD 1/82
  20 DIM A$(2,15)
  30 LET A$(1)="DIRECTION 1-12?"
  40 LET A$(2)="███████████████"
  50 DIM B$(2,15)
  60 LET B$(1)="STRENGTH 1-12?"
  70 LET B$(2)="███████████████"
  80 LET L$="                                "
  90 LET G1=0
 100 LET G2=0
 110 GOSUB 900
 120 GOSUB 600
 130 PRINT 20,4;G1;AT 20,28;CHR$ (G2+156)
 140 IF G1=10 OR G2=10 THEN STOP
 150 LET Z=1
 160 IF F/2=INT (F/2) THEN LET Z=2
 170 PRINT AT 21,0;A$(Z)
 180 INPUT D
 190 IF D>12 THEN LET D=12
 200 LET A=D*PI/6
 210 PRINT AT 21,0;B$(Z)
 220 INPUT S
 230 PRINT AT 21,0;L$
 240 LET S=INT S+3
 250 IF S>15 THEN LET S=15
 260 GOSUB 300
 270 GOTO 130
 300 LET T=1
 310 LET U=1
 320 FOR F=1 TO S
 325 LET P=0
 330 IF BL<1 OR BL>18 THEN LET T=-T
 340 IF BC<1 OR BC>31 THEN LET U=-U
 350 LET LB=INT BL
 360 LET CB=INT BC
 370 LET BL=BL-T*COS A
 380 LET BC=BC+U*SIN A
 385 IF BC>31.4 THEN LET BC=31.4
 390 IF S<3 THEN GOTO 420
 400 PRINT AT INT BL,INT BC;
 410 LET P=PEEK (PEEK 16398+PEEK 16399*256)
 420 IF F=1 THEN GOTO 470
 430 PRINT AT LB,CB;"▒"
 440 PRINT AT INT BL,INT BC;0
 450 IF P=23 OR P=151 THEN GOTO 490
 460 IF P=5 OR P=133 THEN GOTO 530
 470 NEXT F
 480 GOTO 510
 490 PRINT AT LB,CB;"▒"
 500 PRINT AT INT BL,INT BC;0
 510 GOSUB 600
 520 RETURN
 530 PRINT AT 21,12;"GOAL";AT 21,12;"████"
 540 IF INKEY$="" THEN GOTO 530
 550 IF P=133 THEN LET G2=G2+1
 560 IF P=5 THEN LET G1=G1+1
 580 CLS
 590 GOTO 110
 600 LET BC=INT ABS BC
 601 LET BL=INT ABS BL
 604 FOR F=1 TO 2
 605 PRINT AT L(F),C(F);"▒"
 610 IF (BL>7 AND BL<12) THEN LET L(F)=BL
 615 PRINT AT L(F),C(1);"*";AT L(F),C(2);"█"
 620 IF L(F)=BL AND C(F)=BC THEN RETURN
 625 NEXT F
 640 FOR F=3 TO 8
 645 IF (F=3 OR F=4) AND BC>10 THEN GOTO 810
 650 IF (F=5 OR F=6) AND BC<1 OR BC>20 THEN GOTO 810
 655 IF (F=7 OR F=8) AND BC<21 THEN GOTO 810
 660 LET L=L(F)
 665 LET C=C(F)
 670 IF LF<>BL THEN LET L(F)=L(F)-(L(F)-BL)/ABS (L(F)-BL)
 700 IF C(F)<>BC THEN LET C(F)=C(F)-(C(F)-BC)/ABS (C(F)-BC)
 710 IF LF<0 OR L(F)>19 THEN LET L(F)=L
 720 IF C(F)<1 OR C(F)>30 THEN LET C(F)=C
 730 IF F/2=INT (F/2) THEN GOTO 770
 740 PRINT AT L,C;"▒"
 750 PRINT AT L(F),C(F);"*"
 760 GOTO 800
 770 PRINT AT L,C;"▒"
 780 PRINT AT L(F),C(F);"█"
 800 IF L(F)=BL AND C(F)=BC THEN RETURN
 810 NEXT F
 820 GOTO 630
 905 DIM L(8)
 910 DIM C(8)
 920 CLS
 930 GOSUB 1200
 935 RAND
 940 FOR F=1 TO 2
 950 LET L(F)=9
 960 LET L(F+2)=INT (RND*20)
 970 LET L(F+4)=INT (RND*20)
 980 LET L(F+6)=INT (RND*20)
 990 LET C(F+3)=INT (RND*10+1)
1000 LET C(F+4)=INT (RND*10+11)
1010 LET C(F+6)=INT (RND*10+21)
1020 NEXT F
1030 LET C(1)=1
1040 LET C(2)=30
1050 FOR F=1 TO 8
1060 IF F/2=INT (F/2) THEN GOTO 1090
1070 PRINT AT L(F),C(F);"*"
1080 GOTO 1100
1090 PRINT AT L(F),C(F);"█"
1100 NEXT F
1110 LET BL=9
1120 LET BC=15
1130 PRINT AT BL,BC;0
1140 RETURN
1200 RAND USR 16514
1210 PRINT AT 20,0;L$;L$;L$;L$
1220 FOR F=8 TO 11
1240 PRINT AT F,0;"▌";AT F,31;"▌"
1250 NEXT F
1260 RETURN
2000 SAVE "█"
2010 RUN
```

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REVERSI

MIRROR ON MEMORY

BY JOHN BALL

It is surprising how we all assume certain abilities in human beings. For example, I covered many important side positions in my book *Key To Othello* with the assumption that my readers had the ability to spot mirror images elsewhere on the board in real games. Computers do not have this in-built pattern recognition, so have to be taught.

I have indicated the basic strategies for playing the game of Reversi, also known as Othello. There are three basic "Rules of Thumb"; (1) Aim to capture the corners, while avoiding playing near the corners for fear of giving your opponent a chance. (2) Capture as few pieces as possible early on, as it ironically weakens your position to capture too many. (3) Avoid taking sides unless you are running out of options, as they are a liability at the end.

These three 'thumbs' can be carefully balanced to form an effective algorithm for playing Othello. Obvious exceptions can also be added, such as take maximum pieces near the end. But no general "thumb package" can always find the best play, without a detailed list of exceptions — to mirror the way a skilled human selects moves by experience.

The ideal would be a massive memory bank of all possible positions, to tell a computer the best move in each case. You would need to use the whole planet earth as a store for that massive job, and hitch-hikers won't always find the answer is 42!

Human beings manage with their limited memory by being very selective in what they learn. We can do the same with a computer, because the symmetry of the board combines nicely with the fact that most vital plays are on the side two rows of the board.

If we work out all the positions for one side, that our Thumbs have missed, we can then describe a mirror image for that same side to cover positions that are the same but the other way round. The same patterns can then be repeated for the other three sides. This provides a memory hall of eight mirrors for the computer to reflect on.

To save memory space, a system of labels for just one "set" can be re-used eight times for the mirrors, by suitable computer loops. Then any additional positions you discover need only be written-in once in the mirror section.

How does this mirror system work? Basically, you are putting special attractive values to a square if the position around it fits a certain shape.

For example in figure 1, there is a hole in a side at "A". If as Black, you don't play there, your opponent will, gaining an option as well as a solid side.

Othello is all about fighting for options — choices of moves — so such spots should be pounced on. Simply tell the computer in the mirror section that if b, c, and d are occupied, then play at A, or at least make A highly attractive.

A more complicated item is shown in figure 2. Your opponent has played a terrible move — near a corner. To exploit this fully you must play first at F, then at G, then at H, all the time watching out for any replies that should evoke a different response.

The end result should be a captured corner, and an easily won game. So put lots of ifs and buts in the memory mirror, to make sure that the computer plays in the correct sequence.

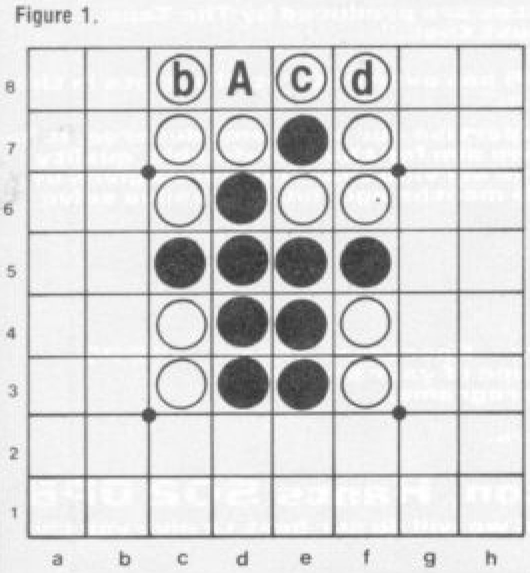
Watch out for cracks in the mirror. In figure 3, playing as Black at I is obviously essential to save the corner at J. So you describe the five pieces in between, and say that I is massively attractive.

But what if white had a piece at J? Then it becomes essential to *avoid* I, as it would give away the whole side and next corner. So make sure that you specify *all* the relvant squares.

Once you have a mirror system established, every time you discover a weakness in the computer's play you simply add another line to the mirror memory, saying "stop playing that rubbish move in that position, play this instead".

It should remember more consistently than you — so watch out.

Figure 1.



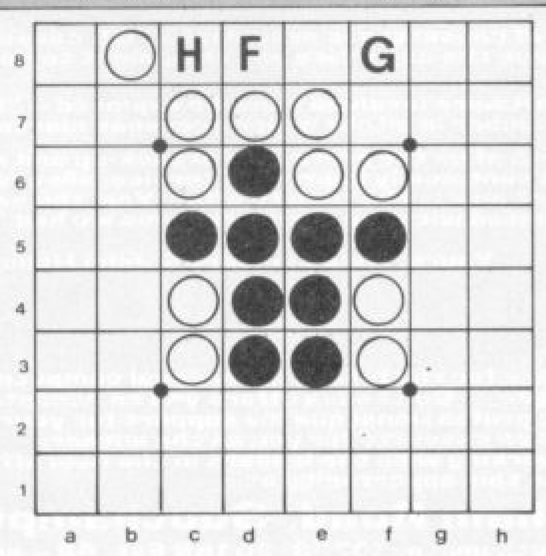
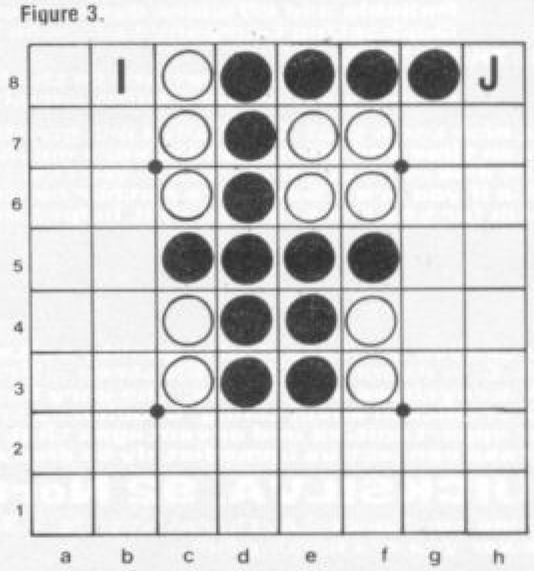


Figure 2.

Figure 3.





IF YOU WRITE SOFTWARE THEN READ ON...

15 months ago we had written some excellent Games Software for the ZX-81, but when debugging was finally completed we realised that much of the work remained.
Who could we rely on for the effective marketing and production of our efforts?
Who would give our software the chance it deserved?
No company was really giving ZX Software the professional backup and production it deserved so we created Quicksilva to fulfill this role.
Now Quicksilva has developed a set of specific policies to match our beliefs about how a company of this kind should operate.

CUSTOMERS
The highest priority must be given to customer service — "QS customer relations are the best in this field."

SOFTWARE
A high standard must be maintained for all software — "QS reputation for innovative software is firmly established."

PRESENTATION
Should support and enhance the software — "QS policy is to use full colour reproductions of specially commissioned artworks to match the standards of the programs.

ADVERTISING
Needs to be accurate, informative, enjoyable, eye-catching and effective — See recent magazines.

PRODUCTION
Reliable and efficient duplication of cassettes is essential — "QS cassettes are produced by The Tape Duplicating Company Ltd., who have the expertise and equipment to do just that."

DISTRIBUTION
All avenues appropriate to the Software involved must be explored — "QS has over 200 retail outlets in this country alone and a substantial number in all the major overseas markets."

We now know that Quicksilva will give both of us the professional back-up and expertise our programs deserve. It has taken time and effort, and is very much a continually improving service; always we aim for that indefinable 'quality' that makes all the difference. We feel that now is the time to offer 'You' the same service that Quicksilva gives us.
So if you are a Software Author confronted with the same problems we had 15 months ago, let Quicksilva solve them for you and help you as it helped us.

Yours, Nick Lambert & John Hollis

Quicksilva is interested in quality software for the following personal computers — Spectrum — Atari — VIC 20 — B.B.C. — Atom — ZX81 — Electron — Dragon   Quicksilva offers you on acceptance of your program:
25% royalties on all sales; the very best professional quality support for your programs;
full credits in advertising, brochures and on cassette for you as the author;
the opportunities and advantages that working with the leaders in the field offers.
Please contact us immediately to discuss this opportunity at

QUICKSILVA, 92 Northam Road, Southampton, Hants SO2 0PB

or ring our Special Authors' Hotline — Southampton (0703) 20169 Ext. 42 — and we will do our best to give you the answer you are looking for.

Graphics

PATTERNS AND PROGRAMS

Constructing patterns is a good way to illustrate how to build programs. Just as a complicated pattern can be developed using simpler sub-patterns, so a complex program can be developed from simpler sub-programs.

In dealing with graphics programming there is direct correspondence between the way in which a pattern is built up and the way the program to draw it is constructed.

For this reason a pattern can actually be seen as a picture representing the structure of the program that drew it.

Making patterns with a micro is also a fascinating way to use it and to show off its graphics capabilities. Random patterns can be generated quite easily, and introductory manuals for many micros contain such programs.

Patterns generated in a systematic and non-random way can also be attractive and interesting. Whether or not patterns have a random element they can be informative, arising as they do in the simulation of such things as the growth of living organisms and the development of economic systems.

The first requirement in displaying a pattern is to describe it to the computer, and this requires the use of a computer language.

It is possible to describe patterns using Basic and the plotting commands it possesses, but other languages can be more suitable.

For example, a square can be plotted using Basic with the following instructions (or with something very similar involving PLOT).

```
10   MOVE 0,0
20 DRAW 0, 10 : DRAW 10,10
30 DRAW 10, 0 : DRAW 0, 0
```

In LOGO (or using 'Turtle' graphics) a square is produced by:

```
REPEAT 4(FORWARD 10 TURN 90)
```

You may agree the Logo description is more natural, giving as it does a direct set of instructions for the following a square which you could actually follow yourself, whereas the Basic description requires a knowledge of where the points such as (10,10) have, perhaps arbitrarily, been placed.

In any event, if you consider how to generate Figure 1 in Basic using a

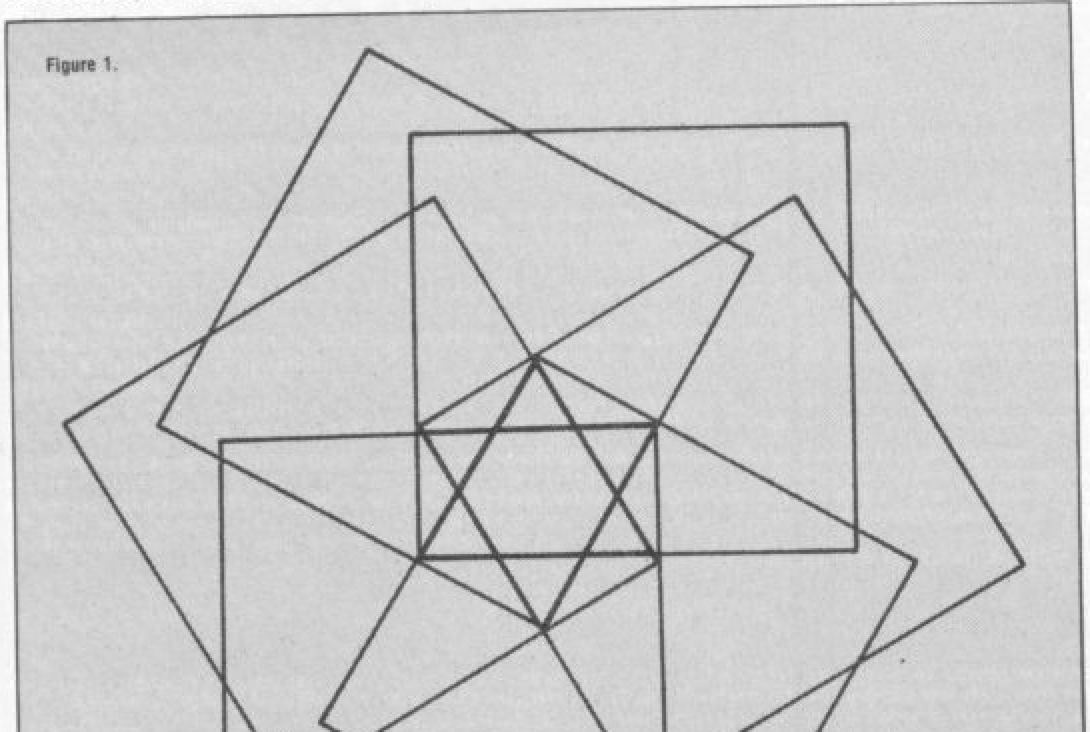


Figure 1.

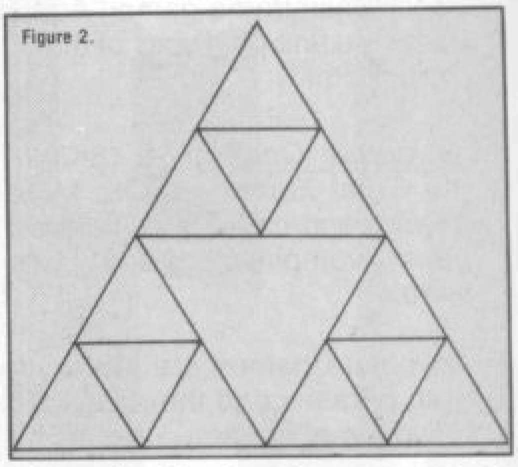


Figure 2.

subroutine for drawing a square as the fundamental building block you may decide that it is none too easy, whereas in Logo it is quite simple.

To build the pattern in Figure 1 from a square, we need a sub-program to draw a square, and in Logo this can be defined by:

```
TO SQUARE
REPEAT 4 (FORWARD 10 RIGHT 90)
END
```

Using this program, Figure 1 is generated by

```
REPEAT 6 (FORWARD 3 RIGHT 60
          SQUARE)
```

In addition to its simplicity, the construction of this program exactly reveals that of the pattern.

The Logo program uses its sub-program in exactly the same way as a Basic program can use a subroutine. However, Logo can also support recursion, so that sub-programs can call themselves, whereas most micro Basics do not. (Atom Basic and BBC Basic are notable exceptions.)

The pattern of Figure 2 can be constructed using recursion. The rule for making the pattern is: Take a large triangle, and at each end of its corners construct a new triangle with half its height, then do the same for each of the new triangles and so on until the triangles become so small that we can halt.

The process has been carried three times in the figure.

The pattern was produced by defining TRIFILL as

```
TO TRIFILL : SIDE
  IF : SIDE 5 THEN RETURN
  REPEAT 3 ((TREFILL( : SIDE/2) FOR-
WARD : SIDE
  RIGHT 120))
  END
```

and then executing

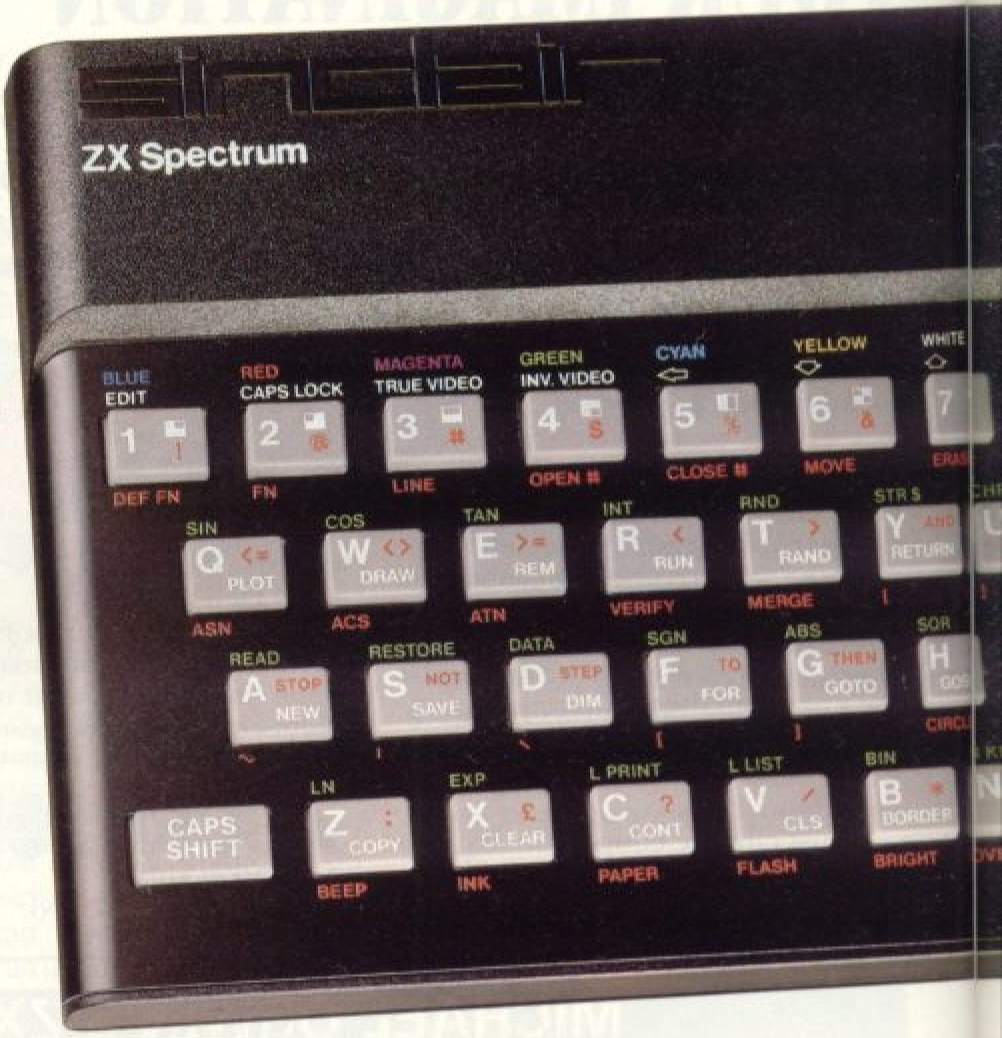
```
TRIFILL 24
```

BY GARRY MARSHALL

Sinclair ZX Spectr

16K or 48K RAM... full-size moving-key keyboard... colour and sound... high-resolution graphics...

From only £125!



First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500,000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power– personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.



Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

rum



The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.

The ZX Microdrive – coming soon

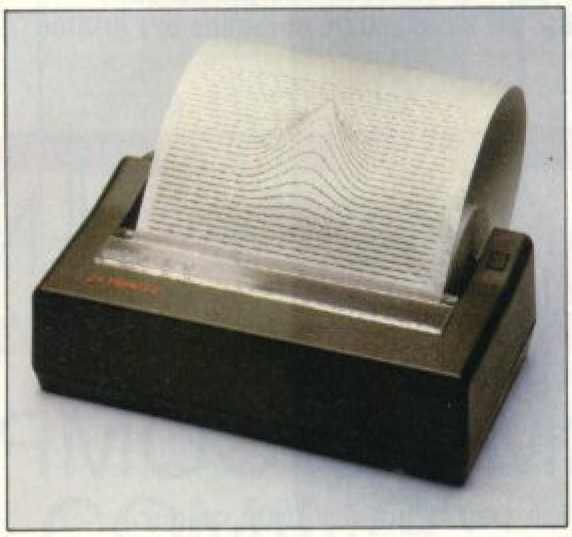
The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing.

Each Microdrive is capable of holding up to 100K bytes using a single interchangeable microfloppy.

The transfer rate is 16K bytes per second, with average access time of 3.5 seconds. And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum.

All the BASIC commands required for the Microdrives are included on the Spectrum.

A remarkable breakthrough at a remarkable price. The Microdrives are available later this year, for around £50.





RS232/network interface board

This interface, available later this year, will enable you to connect your ZX Spectrum to a whole host of printers, terminals and other computers.

The potential is enormous. And the astonishingly low price of only £20 is possible only because the operating systems are already designed into the ROM.

ZX Spectrum

Available only by mail order and only from

sinclair

Sinclair Research Ltd,
Stanhope Road, Camberley,
Surrey, GU15 3PS.
Tel: Camberley (0276) 685311.

How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp needed coupon below. You can pay by cheque, postal order, Barclaycard, Access or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			Total £	

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £ ________

*Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable

Signature

PLEASE PRINT

Name: Mr/Mrs/Miss

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FREEPOST – no stamp needed. Prices apply to UK only. Export prices on application.

PUZZLER IN CHIEF

Welcome to the first *Computer & Video Games* puzzle page which will appear every other issue with a selection of simple brain teasers and harder brain manglers. These may have you reaching for the trusty computer to help you through some laborious number-crunching.

On some occasions, (the Mastermind puzzle) you will be invited to send in your answer to try to win a prize. Others we expect to be solved quickly.

The resident puzzle master will be Trevor Truran, and we invited him to write a small biography to explain his credentials.

He did! It started: "Age: In three year's time my father's age will be double what my age was two years ago . . ." And then Trevor's natural modesty took over, so we thought we'd better take a hand.

Trevor is a former puzzles editor of *Games & Puzzles* magazine, he now edits *Top Puzzles*.

If you have any ideas for computer puzzles yourself, please send them in to us and we will pass them on to Trevor, he pays £5 for each one published.

Apart from the Mastermind competition, all other puzzle solutions are printed on page 11.

SWORDS OR WORDS

The answer to each clue is a six-letter word and sometimes that word is to be entered clockwise in the cells of the hexagon — starting in the numbered cell.

On other occasions, though, the word to be entered is *an anagram* of the clue word! (Entered in just the same way).

To help you decide which to use when, the answers have been so arranged that touching cells of neighbouring hexagons will both have the same letter.

One pair has been filled in to give

PUZZLING

MASTERMIND COMPETITION

No, don't panic! We are not going to strap you into an overgrown black leather chair and grill you for two minutes on *Pre-Dynastic Etruscan Pottery*.

All you have to do is crack the codes hidden in these examples of Invicta's classic peg puzzle.

Each picture shows you the position in a computer generated game just before the hidden line is correctly formed. There are six colours to choose from and they may be repeated — though there will be no blanks in the code.

Each attempt has been scored at the side — a black marker indicates that a peg is the correct colour in the right hole; a white marker shows that a correct colour peg is in the wrong hole. A blank shows that a peg is not the right colour.

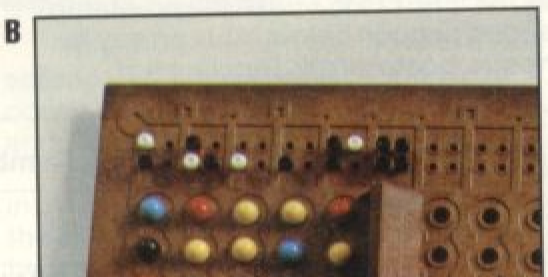
For example: if the hidden code was: red, blue, blue, white. And you tried: red, white, black, blue, the line would show a marker for the red and two white markers representing white and blue.

When you have used the clues given in each picture, write your answers to the codes on a piece of paper (make sure each answer is correctly labelled A, B, C, D) and send it to: Mastermind Puzzle, Computer & Video Games, Durrant House, 8, Herbal Hill, London EC1R 5JB to reach us before 12 November 1982.

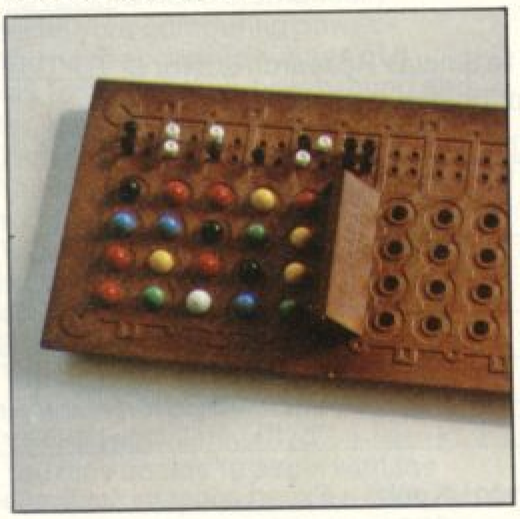
The first three all-correct entries drawn from the postbag will each receive an **Electronic Master Mind** game, donated by Invicta Plastics.

This competition is not open to any employee of East Midlands Allied Press or of Invicta Plastics or their families. The judge's decision, as usual, is final.

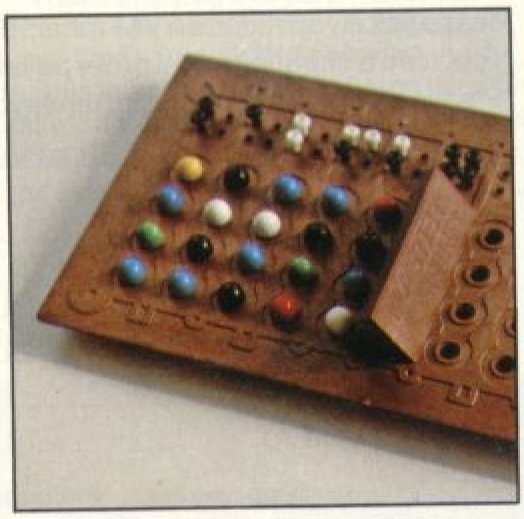
B



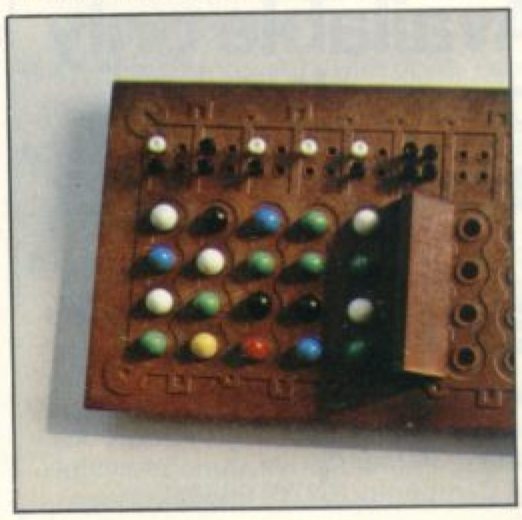
A

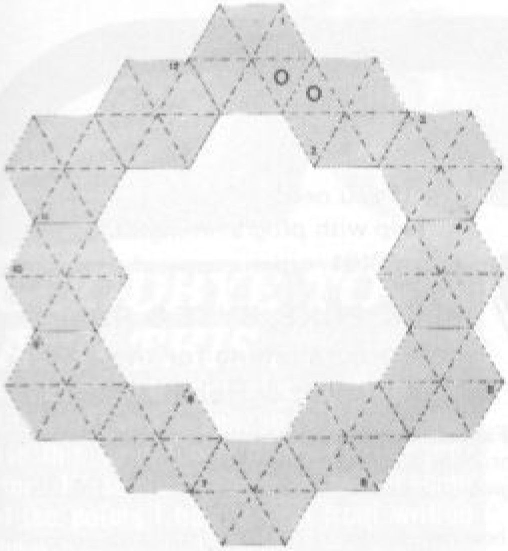


C



D





you a start. Can you solve the clues, find the words, re-arrange where necessary and put it all together?

CLUES:

1. Seat of royalty.
2. Rounded.
3. Domestic fowl.
4. Short time.
5. Lethargy.
6. Accompany a car?
7. Firearm.
8. Persian governor.
9. Relative.
10. A liaison.
11. At large.
12. Another relative!

ALL BOXED UP

Buying fireworks nowadays is, quite rightly, a much harder process than it used to be. For a start you have to be in long trousers and not speak in a piping treble. And, if you visit the newsagent run by Chas Hands, you would need the mental agility of a man seen in a night club from a distance — by his wife.

As Chas cheerfully explains: "I sell two boxes of fireworks, each containing 41 items. The first has a mixture of Rockets, Silver Serpents and Thunder-Claps and costs exactly £5.

"In the second there are as many Rockets as there are Thunder-Claps in the first. And likewise as many Thunder-Claps as Rockets. Both have the same quantity of Silver Serpents. The second one — Just a little over £12.

"Oh, by the way, five Rockets here would cost you the same as 17 Silver Serpents if you could buy them separately — which you can't!'

How many fireworks of each type are there in the first box and what did each cost?

IAN PEDDER

							APPROACH					EXIT				
		MINI	ROLLS	ESTATE	VAN	MAXI	BRASS	GOLD	SILVER	COPPER	LEAD	BRASS	GOLD	SILVER	COPPER	LEAD
	Miss ELLIS															
	Mr PRICE															
	Mrs DOWNS															
	Mr LUCAS															
	Mr TURNER															
APPROACH	BRASS															
	GOLD															
	SILVER															
	COPPER															
	LEAD															
EXIT	BRASS						X									
	GOLD							X								
	SILVER								X							
	COPPER									X						
	LEAD										X					

Miss ELLIS				
Mr PRICE				
Mrs DOWNS				
Mr LUCAS				
Mr TURNER				



COMING AND GOING

Constable Paynting heaved a long sigh and reached resignedly for his notebook.

It was just his luck to be on duty at the town roundabout when stolen goods were on the move. An informer had called the station and an inspector had called him — a vehicle worth investigating had, sometime that afternoon taken the Lead Lane turning. What, he was asked, did he know about that?

Not a lot, it seemed. The traffic had been heavy, the sun bright and hot. As he struggled to recall the recent past, he made notes of the vehicles and locals he knew well who had been in the area.

1. Mr Turner, who did not drive a Rolls, exited down the road immediately to the left of the one he entered along.
2. It was a woman who met the roundabout from Gold Hill but the Mini which left at Brass Way.
3. Miss Ellis left by way of Silver Street but the Estate turned off at Copper Row.
4. Mr Price, in his Maxi, took the first turning off, which wasn't Lead Lane or Copper Row.
5. Neither Mrs Downs' Van nor Mr Lucas used Copper Row or Silver Street.

Here Paynting paused and reluctantly prepared himself for an apologetic meeting with his superiors.

Perhaps you can do better by naming the driver of each car, the road it arrived by and the one it left by and so be able to say which car and driver should be investigated.

To help you sort out the facts, the grid can be used: enter a/for a positive piece of information and a X for a negative one. Of course, no driver arrived and left by the same road.

Kit Korner

GOODBYE TO ALL THIS . . .

As this is going to be the last time that Kit Korner will appear in this form I will use this opportunity to review the previous 12 issues and to relate to you some of the points I have learnt from writing them.

It may come as a surprise to know that I have probably learnt more than anyone who has come to me with a problem will ever learn, in the last year, about kit building. I should therefore like to thank all of those people who made so many blunders and kept me busy trying to solve them.

From the very beginning I assumed that most of my readers knew little or nothing about construction as this was the best way of reaching everyone. I progressed as time went on to consider some of the more complex aspects of the art.

These I tried to explain in the simplest terms so that they followed through from the previous articles. From the limited response I have had this worked quite well. Some readers and friends, however, who already had considerable experience in this field were only really interested in the specific hints I had to give. So, altogether it worked quite well. Now here, and hopefully not in list form, are some of the more important points which I learnt from writing this page.

As a result of reducing production costs the difference in price between kit and ready built models has been reduced to a point where, to a kit builder, it is tempting to buy the ready built model.

I would still not do this, as to reduce the cost involved it appears that the manufacturers have failed to maintain quality. This is apparent in many of the newer models. It is therefore a great pity that so few micros are offered in kit form.

Even when complicated modifications are required for, let us say, a screen memory expansion I would prefer to buy the circuit diagram from the company involved at the modification price and do the work myself.

I feel most strongly that it is essential to know how your machine works if you are going to use it to the full.

Also, I would not undertake to build a kit with only assembly instructions. As shown with the early ZX81s the instructions were at fault, at one point, whereas the circuit diagram was correct.

I am very fortunate in having access to a complete tool kit and workshop which I have found indispensible when it comes to construction. This is also part of my job function anyway, so I am doubly fortunate.

At one stage I outlined the minimum tool kit and later went on to fill it out somewhat. I discovered later that I should not have recommended the minimum version but should have gone for something a little larger.

I hope that if some people did try to build a kit with the minimum of tools that they managed. I have heard no complaints.

Another field that I am fortunate to be a spectator in is that of add-ons. Although I have not built many of these they are usually so simple as to draw no comment.

The kits that are more complicated normally arrive with well-written instructions and are so numerous that it would require the whole of this magazine to list them, let alone review them all. The only point that comes to mind here is to make sure that the kit does come with a full set of instructions and diagrams.

If they do not you should ask for them as a condition of purchase saying that you do not consider the kit complete without having them.

Be a little wary of kits that either originate from abroad or, worse, are mailed from overseas without there being an office in this country.

Not all, or even many, are pirates but someone will be unfortunate and find one that is. The only thing to do is to inform the Director of Fair Trading and all the magazines you care to. You may be lucky and with the possible help of others be able to salvage something from the kit. I sincerely hope that no one does discover a pirate the hard way.

I did not, at the very beginning, believe that I "knew it all" and did consult as many of my friends and colleagues as I could to find out their opinion which has proved useful in many instances.

Unfortunately many of the mistakes I have come across could have been avoided so easily if the offender had consulted someone with a little more experience for just five minutes.

I have stressed the point in the past that if you feel uneasy about some aspect of kit building, stop and consult someone about it. Even contact the suppliers if need be. They will be only too grateful to you for bringing the difficulty to their attention. I am afraid that this will not be the last time I will mention this though.

I hope that this page has been of some help to those who have begun kit building and that you have enjoyed it as much as I.



BY KEITH MOTT

Adventure

THE YEAR OF ADVENTURE

Well, here we are one year later and still going strong! Adventure is as popular as ever, with an increasing variety of games on the market for every conceivable machine.

In the course of the next year I hope to tell you what it is like to play Adventure on a PDP-11, introduce you to Captain 80's Book of Adventure, and give you an assessment of what appears to be the Adventure programmers "last one".

In the meantime here's an "end-of-term" exam to see whether you've been paying attention to what I've been telling you over the past year. All the questions can be answered by reading the Adventure pages in the past years' issues of *Computer & Video Games.*

ADVENTURE QUIZ

1. What advantages does a machine-code Adventure have over one written in Basic?
2. In what Adventure might you find patches of oily slime?
3. What could give you heartburn if your stomach was grumbling?
4. Who are you likely to find following you around in a pyramid?
5. Why would a telescope prove useless on Wizard's Mountain?
6. If you were a Hellfire Warrior, name two monsters that might trouble you.
7. IF: Black Rod = Sceptre
   AND: Small Bird = Bird Statue
   THEN: What is equal to Wicker Cage?
8. What often covers you at the top of an extinct volcano?
9. What keeps falling on my head in the Asylum?
10. Who have delicate ears?
11. In what Adventure would you find yourself in the role of a journalist?
12. What words would you use to get through a hole in the wall in an old Manor House?

THE NOT SO INSTANT KARMA . . .

Having treated my micro to a memory upgrade recently, I was quite impatient to try out a big Adventure on it, so I decided to see if I could lose my way in "Lords of Karma".

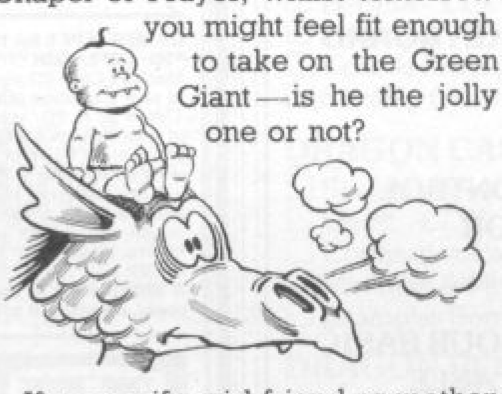
The game opens in the city of Golconda which is surrounded by mountains and forests. Sunlight filters softly through the leaves of Aspen, Oak, Redwood and Pine, to help guide you through the paths and clearings that abound. You will have a long journey, for I estimate that there are upwards of 100 locations in the game.

Your aim it to collect as many "Karma Points" as possible. These are obtained by carrying out brave and kind deeds.

Some deeds, of course, are braver and kinder than others, so you might be easily misled into thinking that because you had gained points, you had performed the right deed in the right place with the right equipment. This is not necessarily so, and a similar act in a different scenario might have proved more fruitful.

Therefore, to achieve a high score, once you have made an initial exploration, the game is best played in sections before tying the whole thing together.

For instance, today you might try to collect a few goodies together and spend your time in retreat at the Chapel of Prayer, whilst tomorrow you might feel fit enough to take on the Green Giant—is he the jolly one or not?



If your wife, girl friend or mother needs a new handbag why not organise a trip to the cypress swamp and go crocodile hunting? Or perhaps carry out one of the special quests set you by the folk you encounter?

I hope I have conveyed how diverse this game is. It is also quite user friendly. The conversation with the computer scrolls, telling you where you are without filling the screen with unwanted detail unless you request it with "LOOK".

A typical response might be: "Up the sky. Down the ground. North a gate. South a path. East an unclimbable mountain. West forest. You are on the Trail of Tears."

My only complaint with the display was the lack of a cursor. It is impossible to tell whether or not you have hit the space bar during input, whether deliberately or accidentally.

Since the game is so large I know not what the highest score is, if indeed there is an absolute maximum. The highest I know of so far is 887, a total reached by Duncan Wood of Chatham, a friend who helped me cover the ground in time for this review.

If you've achieved a score higher than that let me know, and I'll keep a high-score tally running on this page!

Lords of Karma is supplied on a cassette containing a separate recording for each of the four machines. These are listed together with the memory requirements of each, in fig. 1.

The game is published by Avalon Hill and is impressively packaged in a deceptively large box.

It is available from Calisto Computers, to whom I offer my thanks for the review copy.

Figure 1. Machines and memory requirements for Lords of Karma.

MACHINE	MEMORY REQ'D
Atari 400/800	40k
Apple II	32k
Pet 2001	32k
*TRS-80 Level II	48k

*The same recording is also compatible with the TRS-80 Model 3.

ANSWERS TO QUIZ

1. (a) Less memory consuming (b) Executes faster. 2. Adventureland (Scott Adams). 3. Eating Sneakers (Deathmaze 5000, Frank Corr). 4. A small nomad (Pyramid of Doom, Scott Adams). 5. Falls to pieces (Wizard's Mountain, Jeremy Zorwold). 6. (a) Giant Red Ant (b) Great Tick (Hellfire Warrior). 7. Statue Box (Åbersoft Adventure). 8. Sweat (Savage Island Pt. 1, Scott Adams). 9. A piano (Asylum, Frank Corr). 10. The Denizens of the Atom Adventure (J. Spillsbury). 11. Time Machine (Brian Howarth). 12. CLIMB THRU HOLE (Crowley Manor, Jyym Pearson).

By KEITH CAMPBELL

let the DRAGON 32 fire your imagination . . .



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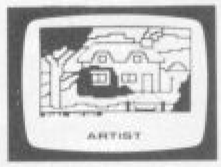
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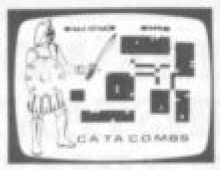


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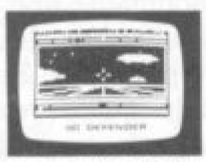
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PRACTICAL PROGRAMMING

THE STONE, PAPER, SCISSORS GAME

In the last 40 years or so there has been a great deal of work done on the mathematical theory of games. The interest in the subject is due mainly to applications in economics and warfare, but the theory does have applications in game playing, and the ideas and terminology came mainly from such games as chess, bridge and poker.

Although the theory of games involves some very difficult mathematics it is possible to understand and use some of the simpler ideas without any knowledge of advanced mathematics.

Let us begin by looking at two very simple games, Matching Pennies and Stone, Paper, Scissors.

In Matching Pennies the two players, A and B, simultaneously lay down their coins; if the two coins both show heads or both show tails, A wins; if the two coins show different sides, B wins.

In Stone, Paper, Scissors, the two players hold out their hands simultaneously, with a closed fist for stone, a fully extended hand for paper, and two fingers extended for scissors.

The winner is determined by the scheme Stone blunts Scissors, Scissors cut Paper, Paper wraps Stone, while if both players show the same the game is a draw.

We can represent these games by the following tables:

Table 1: Matching Pennies

		B	
		Heads	Tails
A	Heads	1	−1
	Tails	−1	1

Table 2: Stone, Paper, Scissors

		B		
		Stone	Paper	Scissors
	Stone	0	−1	1
A	Paper	1	0	−1
	Scissors	−1	1	0

The entries in the tables represent A's winnings, so that a positive number means that A receives a payment from B and a negative number means that A makes a payment to B.

We can now imagine the games being played by A choosing a row from the table and B choosing a column, the result being determined by the entry where the chosen row and column intersect.

Taking this view of a game we can start by drawing up a table at random and defining a game by the table. Consider the following table:

Table 3

		B			
		1	2	3	4
	1	3	2	−3	−2
A	2	1	3	2	−2
	3	2	4	2	1
	4	−2	1	3	0

If A chooses row 2 and B chooses column 1, A wins 1; if A chooses row 2 and B chooses column 4, B wins 2, etc.

In all these games, A and B make their moves without knowing what the other is going to do; if either player knew the other player's move before making his own he could always win. For example, in Matching Pennies, if A knew that B had played heads, A would also play heads and win.

MAKING RANDOM CHOICES WORK

In any game, we expect that there is some "good" way of playing that will give a better result than uninformed play.

In Matching Pennies and Stone, Paper, Scissors, it is clear that if our opponent knows what we are going to do we will lose, so we must make some random choice; it is also fairly easy to see that in both these games the best way to play is to make all the choices equally likely.

For example, in Matching Pennies the best strategy is to play heads 50% of the time and tails 50% of the time, at random. If one player does this he will, on average, win half the time and lose half the time, regardless of what the other player does.

However, if one player deviates from the 50-50 random play and the other player catches on to what he is doing, he can adjust his play to give himself a better chance of winning.

Suppose that player A chooses heads twice as often as tails; if B discovers this he can win by choosing tails twice as often as head, since in this situation, out of every nine plays we will get, on average, two heads twice, two tails twice, one head and one tail five times.

Thus B will win five times for each four times he loses, and in the long run will come out ahead.

In general, if A plays heads and tails at random, but with different probabilities, B can win in the long run by using the same probabilities but switching them from heads to tails and vice versa.

Program 1 plays Matching Pennies in this fashion. The variable Q is used for the probability that the program will play "tails", and is initially set to 1/2.

The program keeps count of the number of times the player has chosen heads and tails in the variables NH and NT, and after 10 games Q is recalculated and set equal to the probability that the player has been using for "heads".

Of course, playing at random with probabilities different from 1/2 is not the only way of deviating from the best strategy. If you play heads and tails equally often but in a regular sequence, such as H,T,H,T . . . or H,H,T,T,H,H,T,T . . . your opponent can win by learning the sequence and playing accordingly.

The program could be modified

```
   5 REM MATCHING PENNIES
  10 LET Q=1/2
  20 LET NH=0
  30 LET NT=0
  40 LET PS=0
  50 LET CS=0
  60 LET N=0
  90 GO SUB 1000
 100 PRINT "YOUR MOVE: H OR T"
 105 INPUT P$
 110 IF (P$<>"H") AND (P$<>"T")
THEN GO TO 100
 115 IF P$="H" THEN LET NH=NH+1
 120 IF P$="T" THEN LET NT=NT+1
 125 LET N=NH+NT
 130 CLS
 140 PRINT "  I PLAY ";C$
 150 PRINT "YOU PLAY ";P$
 160 PRINT
 170 IF P$<>C$ THEN GO SUB 500
 180 IF P$=C$ THEN GO SUB 600
 190 PRINT
 200 PRINT "  MY SCORE ";CS
 210 PRINT "YOUR SCORE ";PS
 220 PRINT
 230 GO TO 90
 499 REM COMPUTER WINS
 500 PRINT "  I WIN"
 510 LET CS=CS+1
 590 RETURN
 599 REM PLAYER WINS
 600 PRINT "YOU WIN"
 620 LET PS=PS+1
 690 RETURN
 999 REM COMPUTER'S MOVE
1000 IF N<10 THEN GO TO 1100
1040 LET Q=NH/N
1100 LET C=RND
1110 LET C$="H"
1120 IF C<Q THEN LET C$="T"
1200 RETURN
```

BY TED BALL

PRACTICAL PROGRAMMING

to handle this situation, but it would be very difficult to write a program capable of detecting more than the simplest sequences.

If we return to the game defined by Table 3 we find a completely different situation. In the case of Matching Pennies and Stone, Paper, Scissors, we could work from the original forms of the games, or from the symmetry of the tables, but here we have an apparently random collection of numbers and no "original" form for the game.

There is a way of finding the best play in this particular case, and to understand how it works it is easiest to start by imagining that B plays first and A plays knowing B's move.

If B chooses column 1, A will choose row 1, because the 3 in row 1, column 1 is the largest entry in column 1.

If B chooses column 2, A will choose row 3, because the 4 in row 3, column 2 is the largest entry in column 2.

If B chooses column 3, A will chose row 4, because the 3 in row 4, column 3, is the largest entry in column 3.

If B chooses column 4, A will choose row 3 because the 1 in row 3, column 4, is the largest entry in column 4.

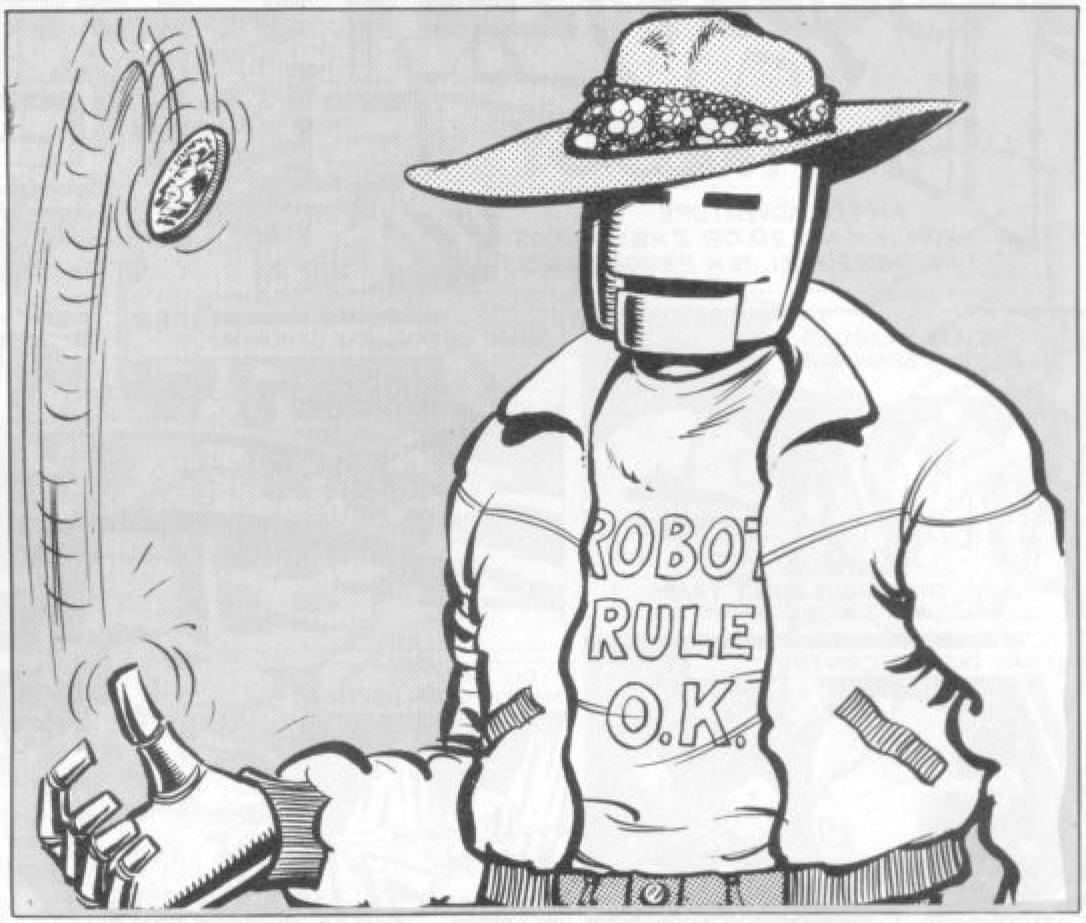
B can work this out in advance, so he will know that if he choose column 1 he will lose 3, if he chooses column 2 he will lose 4, if he chooses column 3 he will lose 3, and if he chooses column 4 he will lose 1. From this it appears that his best play is to choose column 4, as this gives him the smallest loss.

If we now change round and image that A plays first and B plays knowing A's move, we can go through a similar procedure, but this time B will be choosing the column containing the smallest entry.

Summarising A's strategy, if he chooses row 1 he will lose 3, if he chooses row 2 he will lose 2, if he chooses row 3 he will win 1, and if he chooses row 4 he will lose 2, so it appears that his best play is to choose row 3.

In both cases we end up with the same choices, row 3 from A and column 4 from B. This does not happen with every table (see what happens when you use this procedure on Tables 1 and 2).

Illustration: Terry Rogers



Next month will be the last time you will see Practical Programming. Our expert programmer Ted Ball is not leaving us however — he is simply turning his typewriter to other things. He is going to write features on machine code, the first of which will appear in our January issue.

The reason that both ways of working towards the solution give the same result is that Table 3 contains an entry that is at the same time the largest number in its column and the smallest number in its row.

In the terminology of game theory, an entry in a table that is the maximum of its row and the minimum of its column is called a *saddle point*. Thus, Table 3 has a saddle point at row 3, column 4, while Tables 1 and 2 have no saddle points.

In the situation of Table 3, where the best play is always to make the same choice, this choice is called a *pure strategy*; in the situation of Tables 1 and 2, where the best play is to make a random selection among the possible choices, the play is called a *mixed strategy*.

WHEN THERE IS NO SIMPLE WAY . . .

The two games we have looked at that lead to a mixed strategy are easy to solve because of their symmetry. However, in more complicated cases it is not possible to find a solution by simple inspection as we were able to do with Matching Pennies and Stone, Paper, Scissors.

Table 4

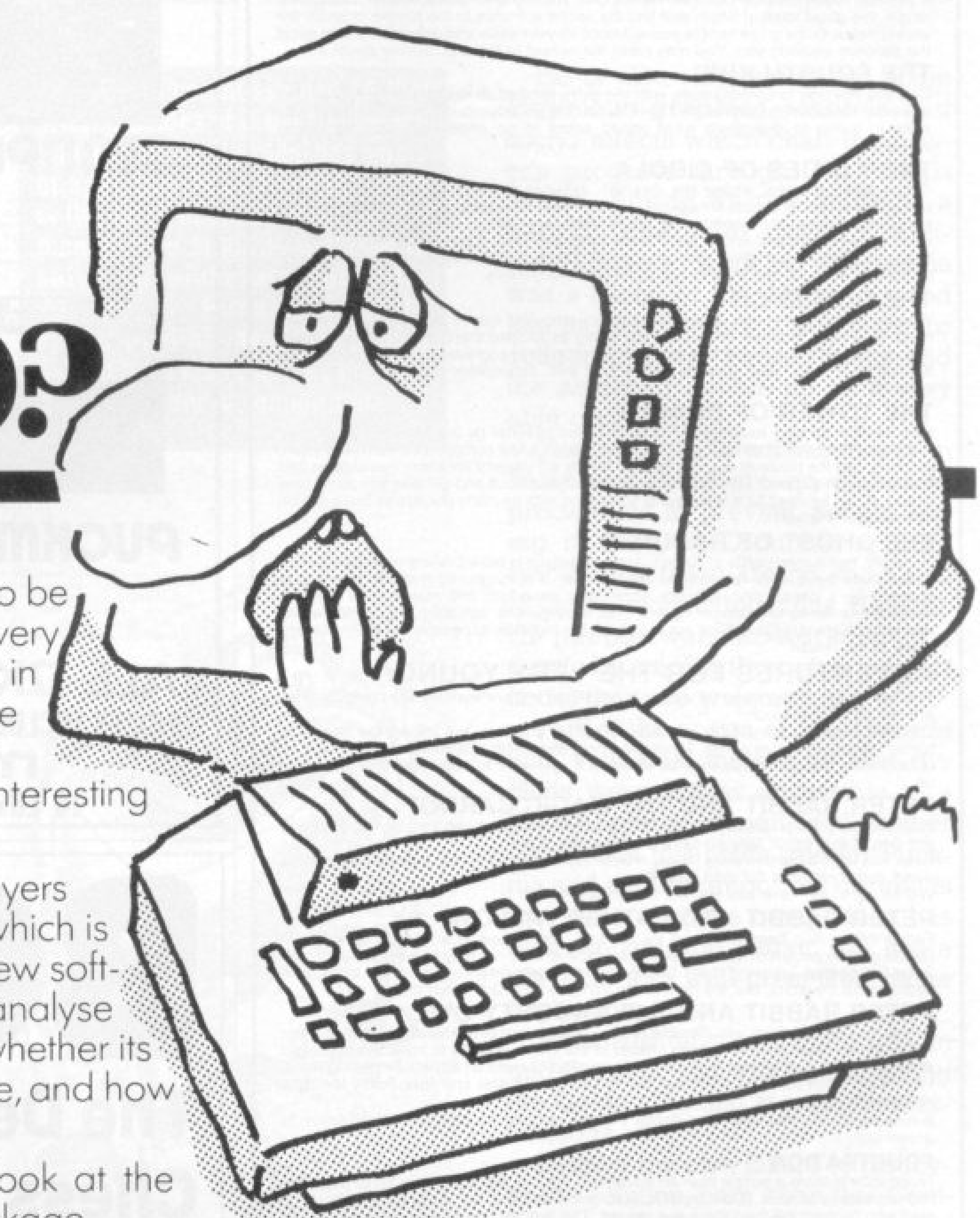
		B 1	B 2	B 3
A	1	−1	1	1
A	2	2	−2	2
A	3	3	3	−3

Table 4 has no saddle point and there is no simple way of finding the probabilities that give the best results for A and B.

There is a mathematical method that can be used on tables of any size and shape, but it is not easy to understand.

However, the mathematical method is not the only way to find the solution, and I will be continuing next month, describing a game which leads to Table 4 and explaining how to write a program that will "learn" the best solution.

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With all this you get the best news, an informative (and fascinating) letters page, and a problem-solver section written by two of the most respected experts in the business. November's issue is at all good newsagents from October 15th. Don't miss it.



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If you can reach his hide-out, then he will give you the elixir of life. Travel through the jungle, the ghost town of Sham and find the secret entrance to the temple in which the wizard hides. Once in the temple you will need all your skills and determination to avoid the dangers awaiting you. You may meet the wizard in the end, but we doubt it . . .

THE FOURTH KIND
Can you manage to communicate with the extra-terrestrials and obtain from them the universal medicine for eternal life? This is not only an adventure but will test also your skills in trying to overcome what would seem to be impossible communication problems.

THE 7 CITIES OF CIBOLA
These famous cities, where the Spanish Jesuites found their gold, are situated somewhere in the South-American jungle. Their whereabouts have been lost for several centuries, and nobody has found them ever since. Can you survive in this exhausting climate and find at least some treasure? And, if you find it, will you still be strong enough to get back with your gold? There is not only the climate; indians, poisonous animals, secret religious sects and many more.

THE DOMED CITY
You are travelling through unmapped territory and your way is blocked by a giant ant heap. By a freak mutation these ants are as big as you and there is only one way open; through the ant's lair. Some ants are friendly, others are aggressive, and your weapons are not much help: your survival depends on skill, anticipation and cunning. Will you succeed?

THE TOWER OF BRASHT
One member of your expedition has been taken prisoner by the Kharrs, a cruel tribe living near the edge of civilisation. You must choose a few companions from your team, and try to get the prisoner out. Success or failure will depend on whom you choose and how they are equipped. This D&D type adventure is difficult and will take you some time to play. It can be used as a roleplaying adventure, with as many players as there can be members of the team.

THE GHOST OF RADUN
In the old, half ruined castle of Radun, a large treasure is buried. Many have tried to find it, but none have ever returned to tell the tale. It is rumoured that the treasure is guarded by a ghost, who appears when least expected, and makes sure that the treasure hunter can no longer return. This adventure is definitely not for the weak-hearted and we strongly advise not to play it after nightfall, especially not when you are alone in the house.

ADVENTURES FOR THE VERY YOUNG:
There is no longer any need for very young children to gaze wistfully at a computer they are not allowed to touch.
This new series of adventures is mainly based on graphics, but follows the traditional pattern of an adventure game. There are some elementary instructions for which a bit of help from the grown ups may be needed. If you want to see some little eyes light up . . .

PETER RABBIT AND THE MAGIC CARROT
Peter Rabbit goes on a quest for the magic carrot. It is rumoured that any rabbit taking one bite of that carrot gets an extra twenty years of life.
Peter has to go through the big forest, meets nice (and not so nice) friends, deals with a dwarf, gets help from old man oak, etc . . .
Will he get to the cave and find the magic carrot?

PETER RABBIT AND FATHER WILLOW
Father Willow has been damaged by vandals, and is now in a bit of a state. Peter Rabbit goes in pursuit of the vandals. They know and try not only to escape but to stop Peter Rabbit from following them. Luckily the latter gets help from the other trees, who heard about the story. But will he find the vandals and have them locked up?

PETER RABBIT AND THE NAUGHTY OWL
Jimmy the Owl has been unsufferable of late. The Council of the Meadows sends Peter Rabbit on an expedition to find the Master of the Owls, in order to have Jimmy taught some manners. The Master lives very far away and its quite an adventure getting there. Will Peter Rabbit come back without having seen the Master and thus Jimmy remain a nuisance?
It now transpires that the Peter Rabbit Adventures can be dangerously addictive to grown ups . . .

FRUSTRATION
Frustration is more a puzzle than an adventure. It looks like a program full of bugs and nothing seems to work. It will be difficult to get to the end, but if you do (and don't go mad with frustration!) then there is a reward. The first ten correct answers received by us will be allowed to choose three of our games, FREE!

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Britain in the sixth century . . . THE ANGLES AND SAXONS are marauding through the Country, leaving behind a trail of blood and devastation. In the South a man is gathering troops and fitting them out. His name is Arthur. You take his role in this fascinating wargame. Will you be able to win all the battles he won and free Britain from the plundering marauders? How good are you at commanding troops, finding the enemy and bring him to battle, sifting information, seeing through the fog of war, deploying your troops and many more similar skills?

BATTLE OF THE BULGE
Ardennes, 1944. The famous "von Rundstedt" offensive.

BATTLE OF THE RIVER PLATE
A simulation of this well known sea battle.

CONVOY
You are the commodore of a convoy under attack from submarines. Instant decisions are required and if you hesitate too long the damage might be worse. Try and locate the enemy and destroy him. Not easy . . . Again graphics, but combined with verbal information.

All these games are available for ATARI and need 16K RAM.

Some of the games will load different programs successively and are thus much larger than 16K.

All C.P.S. Games, except those for children, are priced at £9.50. The Peter Rabbit and Tummy Digs games are now £4.50.

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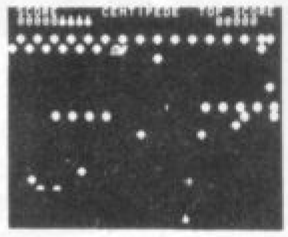
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NEW! # ATOM **NEW!**

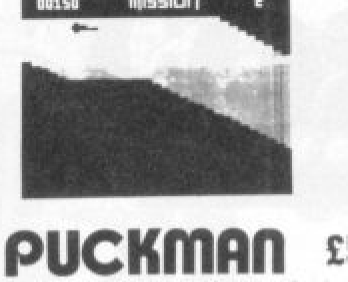
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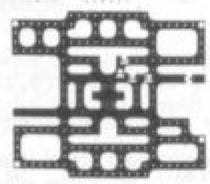


CENTIPEDE £6
The first and only version of this popular Arcade game for the Atom. Shoot down the splitting centipede as it swirls through the mushroom field. Also inhabiting the game are Spiders, Bugs and Snails. The action increases until only skill and quick thinking can save you. Excellent high speed mode 4 graphics, Sound Effects and Top score.



OMEGA MISSION £7
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PUCKMAN £5
One of the best versions of this popular Arcade maze chaser game. Eat all the dots in the maze but watch out for the hungry ghosts! Eat an Energy Blob and the chase reverses. Each maze cleared brings a new one with faster ghosts. Excellent high speed mode 4 graphics, Sound Effects and Top score.



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PIMANIA

A specially commissioned £6,000 prize provides the best evidence that computer gaming has come of age. The Golden Sundial of Pi is the prize destined to grace the mantlepiece of the first person to solve an elaborate computer adventure, Pimania. TERRY PRATT tried his hand at Pimania — and from his report his mantlepiece is likely to remain bare.

Pimania is an aptly named computer adventure game. It sends players around in circles and quite probably turns them manic.

But with a specially commissioned gold and diamond sculpture-valued at £6,000 on offer as a prize, it is well worth the risk of trying to discover its secrets.

The adventure comes in cassette form for the 48K Sinclair Spectrum — although there are plans to put it into other computers in the new year — and is the brainchild of Porstmouth-based software house, Automata Cartography.

The idea follows the formula of the successful Kit Williams' book, *Masquerade*, which challenged readers to use clues in the book's illustrations, to discover the whereabouts of a jewelled hare which the author had buried at a secret location.

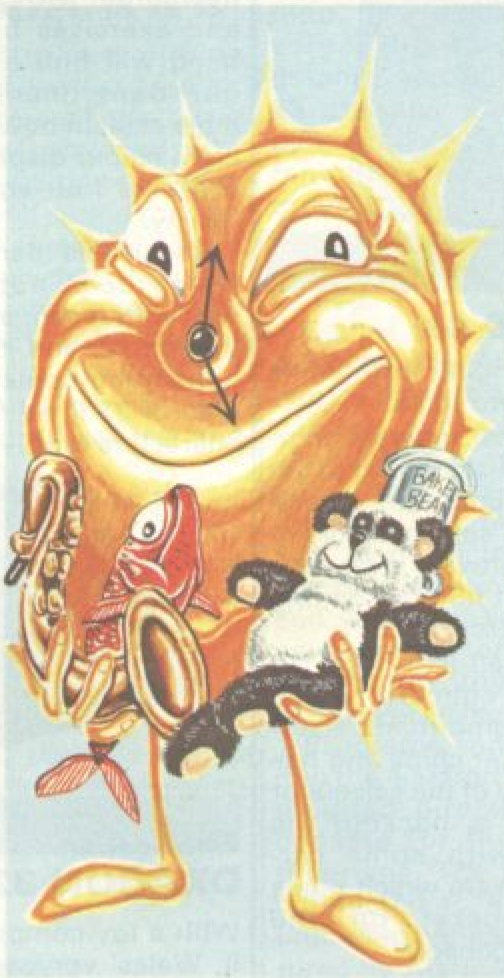
Automata's prize is the Golden Sundial of Pi and although it is still in the designer's studio, we will bring you a photograph of it in our next issue.

The sundial will not be hidden away but would-be solvers will have to sift through the numerous clues in Pimania to discover the "time and place" where it is metaphorically hidden.

The first person to get in touch with Automata and give the correct solution, wins the Golden Sundial. But the company's managing director, Mel Croucher is confident that it will be several months before anybody cracks it.

He told us: "You go through a series of Gates of Pi and the last one reveals exactly what we want by way of a solution. We are not encouraging people to start digging things up but hope they will meet us at the correct time and place."

Purchasers of the £10.00 cassette face their first puzzle almost as soon as the game has loaded–how to get started? The computer screen explains that one key will activate the game but then it's up to the player to press the right combination on the keyboard. I ended up going through the keys systematically before the obvious struck me.



But after that hints and clues are liberally scattered in an Adventure enthusiast's dream of frustrating mazes, unlikely treasures and abrupt dead-ends.

Every time you stop and start again the treasures will be redistributed around the maze — but you can save the game during a successful run.

There is also an entertaining array of responses to the sort of desperate drivel which adventure games usually reduce me to, the: "Help! I can't take any more! Let me out!", variety. The sense of humour is strong throughout and belongs to programmer Christian Penfold.

He is also responsible for some ingenious graphics routines and sound effects which chart the player's progress through the Pimania realm. Acting as the guide is a cartoon character called the Piman. I couldn't work out whether he was a friend or foe. He has a good line in merry quips, a penchant for collecting some bizzare items and the ability to double up as a very able chorus girl.

The program is written mostly in Basic and there are no elaborate precautions to prevent people listing it. But Mel Croucher is convinced that there are no short-cuts to the solution in doing this. He says: "If people want to work out the puzzle by wading through masses of code, they are welcome to try."

Part of the charm of *Masquerade* was Williams' insistence that the clues were just as accessible to a child's mind as an adult's. Croucher claims that this holds true for Pimania and another important criteria is that even after the competition has been solved, the owner still has a playable and well-presented game for his money.

Automata launches the game in mid-October and will be displaying the Golden Sundial at computer exhibitions.

Despite my own failure to discover the solution, I am keen that *Computer and Video Games* should share in the glory of winning the Sundial.

To this end we will be referring readers' Pimania letters to Automata and hopefully printing any tips or helpful hints in our Mailbag section. So please write in if you think you can pass on something useful and perhaps the combined might of the *C&VG* readership can resolve the puzzle of Pimania.

The only tips I can offer are:

- Look for clues even in the instructions.
- Take a pencil and paper around the maze with you and map it out.
- Dismiss nothing in the program — even the music should be noted down — it could be significant.

Good luck and watch out for red herrings!

SANTA'S COM

FATHER XMAS
1 NORTH POLE
ARCTIC CIRCLE
TOP OF THE WORLD

To: The Ed.,
Computer & Video Games
73rd Chimney past St Pauls
London

Dear Sir,
Many of my regular customers are putting in most unusual orders this year. I have had requests for Genie's, Dragons, Atoms and all sorts. Some gentleman called Vic seems to be in great demand too. This electronic age has left me longing for the old days when dolls and footballs seemed to be the rage and made me feel quite old fashioned.

It's got to the stage that when a young lad asks for a Pet, I hesitate to drop him in a puppy! Could you help by pointing out the top selling computers this Christmas and giving some tips on how to go about buying them — my elves will have to work out some kind of wholesale deal I imagine.

If you could take the trouble to keep an old man up to date I would be very grateful.

Yours sincerely,
S Claus

COMMODORE VIC-20

The Vic-20 will be one of the most readily available microcomputers on sale this Christmas.

It can be bought in most high street branches of Boots, Dixons, Rumbelows and Currys — plus computer specialists — for around £169.

A compact computer with a moulded typewriter style keyboard, which gives it an advantage over rivals like the Atari 400 and the Sinclair duo, the Vic works with an ordinary domestic TV set.

It comes with a manual written for the computer newcomer with examples and exercises but the old hand will find a lot of his questions unanswered. It does explain how to use the eight colour display and impressive four-voice sound facility.

The usable memory is 3½K which does not compare well with recent additions to the market and it has a disappointing screen text display of 23 lines deep by 22 characters long.

The computer comes from the well-established US micro manufacturer Commodore which is backing it with a large range of peripherals, disc drives and a printer and, unusually, some high-quality games.

This comes in both the common cassette form and cartridges which plug into the back of the micro. These have the advantage of adding the necessary extra memory to the Basic machine to give good arcade quality games but cost upwards of £17.

Games-playing aids like joysticks and paddles, plus printers, disc drives, memory expansions and light pens are available from Commodore and independent sources.

The Vic is a reliable loader of cassette software but you will need to buy the Commodore recorder (cost £44) to use with it.

The low basic memory and cumbersome text display give the year old Vic a dated look but it has some high quality games software available.



TEXAS INSTRUMENTS TI/99 4a

Previously the undiscovered microcomputer, the Texas Instruments TI 99/4a now seems to be establishing itself in the home market, a year after its launch.

This computer was one of the first into the high street at outlets like Rumbelows but its recent price drop to £199 has made it much more competitive.

It has an adequate typewriter style keyboard and a readable 24 line by 32 character display on any domestic TV set. The manual is well thought out with a quick reference chart and will take the beginner into such computer mysteries as user-definable graphics without too much difficulty.

The 16 colours are more than can usefully be utilised and do have a slightly muddy quality. But it can produce a wide range of sounds, ranging from white noise to pure tones.

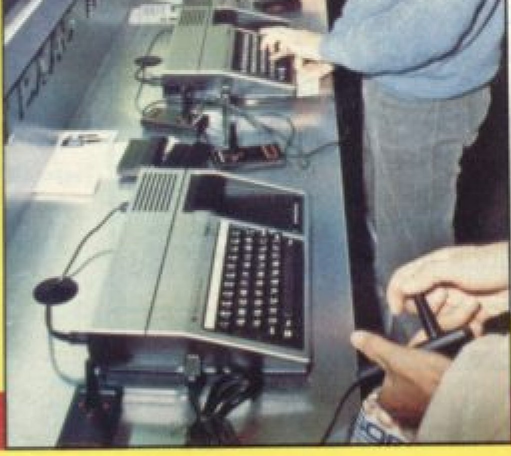
The Texas software market is only just starting to get off the ground with several companies set up to distribute US software over here and a small number writing their own programs.

Texas itself is a huge US computer concern which made its name manufacturing computer chips and has a good slice of the calculator market. It is backing the machine with some cartridge software which plugs into a socket on the machine's console.

The 16K memory included in the basic machine can be expanded up to 48K and the Extended Basic cartridge which introduces SPRITES, movable graphics characters is a worthwhile buy for the games programmer.

Disc drives and a printer are also available from Texas, as are joysticks.

The Texas comes across as something of a rogue microcomputer, using a Basic all its own and has several other peculiarities which set it apart from rivals. But with software backup and the new low price it should sell well.



DRAGON 32

With a toy company behind it, Wales' very own Dragon 32 microcomputer should be a games-player's machine.

It is! But despite all the careful thought that has gone into it, there are reservations. It is a compact computer with a typewriter keyboard which utilises a normal domestic TV and cassette recorder.

With 32K memory, colour graphics and sound for only £199 it also sounds a good buy.

It uses the 6809E microprocessor and much of its games software has been converted from the closely related Tandy Colour Computer. As it is such a new machine what software there is comes from the manufacturers.

Dragon Data is a subsidiary of Mettoy, toy company and the emphasis has been put on the computer being a family acquisition.

The ports and sockets are all clearly marked and the manual gives a clear diagram showing how to set it up. The manual tries valiantly and should help most beginners into understanding the beast.

There are nine colours on the Dragon 32 and it offers a comprehensive variety of musical options. There are five levels of graphics re-



solutions enabling the user to draw lines, arcs, circles and utilises a PAINT operation for solid areas.

The display uses only a small area of the TV set and does look rather twee, although it manages 16 lines of 32 character text display.

On paper the Dragon sounds a marvellous machine but so far the software has seemed unimpressive and it has not been around long enough to prove that really good games can be put on it.

BBC MICROCOMPUTER MODEL A & B

The BBC Microcomputer has had a troubled first year since being launched amid glowing reviews last January.

Rushed out to coincide with a BBC television series, it did not have a proper introduction manual, its manufacturers underestimated the demand for the Model B version and too many purchasers spent too long on the waiting lists.

Now a comprehensive user manual is being sent out, the waiting lists have been cut, but it is possible to by-pass these entirely by going to specialist dealers like North London-based Microage.

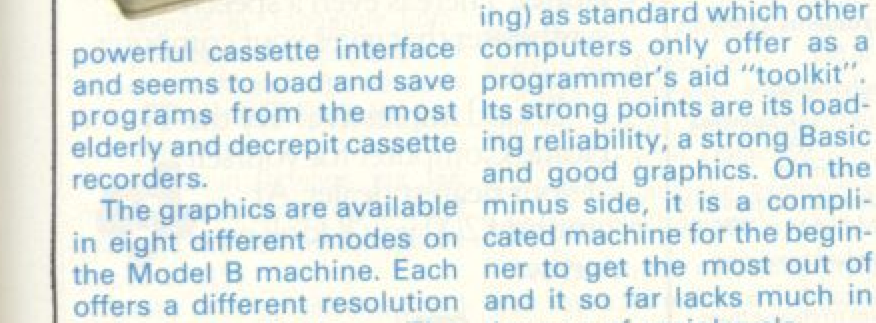
The BBC is a large flat microcomputer which boasts a robust typewriter style keyboard which will please the typist. It has a powerful cassette interface and seems to load and save programs from the most elderly and decrepit cassette recorders.

The graphics are available in eight different modes on the Model B machine. Each offers a different resolution and text display. The claimed 16 colours include several that are just flashing combinations of the basic colours but combined with the high resolution possibilities and good sound quality, the Model B offers games software which is as playable as the arcade originals.

So far BBC software has been slow to develop, but those games which have been produced are fast and impressive.

The Model A has 16K of usable memory and the Model B 32K and they cost £299 and £399 respectively. The A also has only four graphics modes and its games software is more limited.

The BBC Basic is highly rated as Microsoft compatible but including much more. It has many commands (like automatic line numbering and renumbering) as standard which other computers only offer as a programmer's aid "toolkit". Its strong points are its loading reliability, a strong Basic and good graphics. On the minus side, it is a complicated machine for the beginner to get the most out of and it so far lacks much in the way of peripherals.





ATARI 400 and 800

The Atari range of computers is establishing a firm hold in the UK market — and will be a top seller this Christmas.

There are two models on sale, the 400 which costs £199 and the 800 at £599.95.

Both the 400 and the 800 have many features in common. The machines have very highly regarded graphics capabilities — with 29 graphics keys, and 16 different colours with 16 intensities, which simply means the machines are capable of producing a very good game of Space Invaders.

Games are a good starting point for the Atari computers as there is a rapidly expanding number of games available — mainly imported but some home produced — for the 400 and 800. Many of these games are of exceptional quality and very well known, such as Pacman and Missile Command. Joysticks and Paddles are also available.

Programs can be loaded into the 400 from cassette or plugged directly into the console for the cartridge programs. The 800 can be connected to a disc drive unit which is also manufactured by Atari.

Extra memory can be added by installing either the 8K or 16K memory expansion unit. There are three different printers available for the 800, and two for the 400. Modem devices are available to enable you to gain access to telecommunications information networks.

The basic differences between the two machines are that the 800 offers you an electric typewriter style keyboard whereas the 400 has the touch-sensitive keys.

The 400 has only two languages which can be used — Basic and Assembly language — the 800 is compatible with Extended Basic, Pilot and Pascal.

Both machines are good teachers. The sound capabilities plus the instruction manuals and tapes teach you computing, illustrating points on the screen and speaking to you in synthesised speech. The Basic program, however, does not come with the Atari 400 but has to be purchased separately at approximately £50 which includes two instruction manuals. There are a number of other educational packages available.

The Atari 400 is a good family computer with impressive games and educational packages available in quantity. The 800 is probably over-priced.

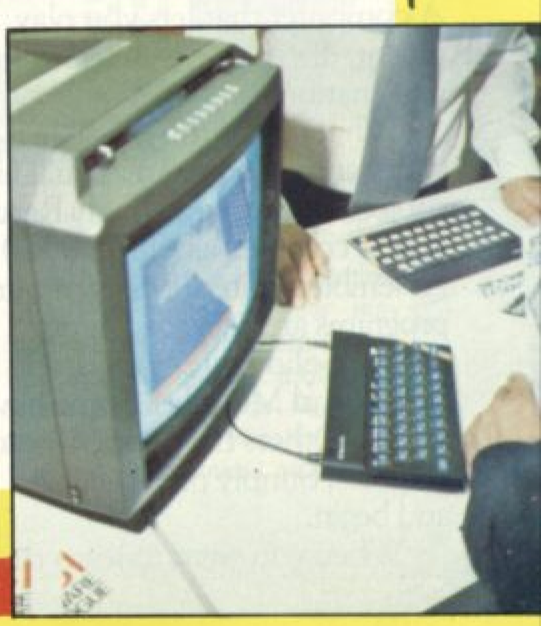
ZX SPECTRUM

The Sinclair ZX Spectrum is building on the incredible success of the ZX81 and is destined to be a big seller this Christmas.

This is despite the fact that it is only available through mail order from the manufacturers. It is undoubtedly a bargain price at £125 for the 16K model and £175 for the 48K version.

The tiny computer features a push button, calcula-

Continued on page 89





2
LAST SCORE 6480
HIGH SCORE 6480
SCORE 200
TI-99/4A
TEXAS INSTRUMENTS

Continued from page 87

tor-type, keyboard with one key word entry which takes some getting used to.

Sinclair Research is Britain's low-cost computer specialist, now with several years of mail order experience behind it. The company does not usually write its own software but a huge cottage industry has built itself around the Sinclair name.

These come in cassette form and the Spectrum is a far better loader and saver than its predecessors with a VERIFY command ensuring that a program has been properly saved.

Sinclair also scores on the peripherals side with a cheap printer, £59.95, and the promise of ZX Microdrives, around £50, to come.

The Spectrum is an innovative but unpretentious computer which will quickly enjoy a vast and competitive games software library. Many people will find the small button-like keyboard an irritation and on any benchtest it will prove a slow runner.

Editor's reply: In response to your query Mr Claus, I have outlined the seven machines which we expect to be the top sellers this Christmas.

If your elves in the ordering department have any difficulty with some of the terms we have used, I have incorporated a small glossary of terms, which should help in understanding the kind of jargon which computer adverts and salesmen have a tendency to lapse into.

As this is such a fast-growing market there are several machines which are coming out between now and Christmas, or have already been announced and may seem worth waiting for, even though they are not due in the shops until early next year.

These can hardly be given an honest criticism when software houses have not had a chance to produce games for them or we to test out the standards and quality of those games.

But we have included a few brief details about six of these machines, which will also provide an idea about how this market is developing.

Finally there are many questions the conscientious buyer can ask himself or his dealer to ensure that he ends up with a computer to suit his needs and his hopes for it. We have included a guide on how to approach buying a microcomputer, compulsory reading for all elves who have to deal with the trade.

SINCLAIR ZX81

The Sinclair ZX81 is still the cheapest introduction to microcomputing it is possible to get in this country.

Now available at £49.95, the ZX81 is no longer limited to mail order purchasers.

For your money you receive a small black computer which, at first sight, looks no bigger and no more than a calculator. You also get a power supply, mains leads to connect your ZX81 to a cassette recorder and to a black and white TV set, and a widely respected instruction manual which teaches you Basic through a series of operating exercises.

If you opt for a ZX81 you will benefit from the enormous range of software which has been built up.

The basic machine has limited memory capacity with only 1k for user programs. It also has a much-criticised flat, touch-sensitive keyboard.

The ZX81 is easily expandible for beginners who have out-grown the limited capabilities of the standard package. Expansion boxes are available which plug into the back of the ZX81 increasing the memory up to 16K, 32K, or even up to 64K. An inexpensive printer is produced by Sinclair at £59.95.

Games players are also well catered for in the add-ons department with joysticks and graphics ROM which enable you to enhance the graphic capabilities of the ZX81.

As an introduction to Basic programming it is still a marvellous buy but the demand for sound and colour graphics and its notoriously inefficient loading ability means that its days are numbered.

JUPITER ACE

Go Forth and conquer the personal computer market.

That's the hope of Cambridge-based Jupiter, which announced its Jupiter Ace microcomputer this summer.

The Ace is unusual in its departure from Basic as the main programming language.

Instead it is offering "the language of the future", Forth.

For a price of £89.95, the Ace comes with 3K of memory.

It is a high resolution black and white microcomputer designed and produced by two ex-Sinclair engineers.

Jupiter claims that Forth, which can be found on several other microcomputers as a compiler cassette or cartridge, is easy to learn but operates faster than Basic.

The Jupiter Ace is a small computer with push button type keyboard.



ORIC 1

The Oric 1 is the latest microcomputer to be announced as a rival to the Spectrum.

Designed by Tangerine Computer Systems, the machine will come in 16K and 48K versions and will be launched by Oric Products.

Due out in October, the 16K model will sell for £99 inclusive of VAT and the 48K model will be priced at £169.

It runs on Microsoft Basic and Oric Products claims that a software house is already compiling a comprehensive range of business and home software for the machine.

Both versions offer 16 colours and the text is displayed in 24 rows of 40 characters.

It has a dedicated sound chip and the games enthusiasts are catered for with some pre-programmed sounds, like: explosions and laser blast noises.

A push-button calculator style type keyboard makes it still more reminiscent of the Spectrum.

THE BINATONE COMPUTER

The Binatone Computer is currently causing a good deal of excitement in home computer circles.

Although it is not due to be released until Easter of next year, it does give some indication of how the home computer market is going which is why it has been included here.

It will cost £49.95 and offers 16K of memory expandable up to 64K.

As it's launch is still some time away the details below may change but Binatone are hoping to include 16 colours, a Basic as close as possible to Microsoft and a resolution of some 40,000

Continued on page 91





WE PROUDLY PRESENT, FOR THE VIC 20

THE INTERNATIONALLY SUCCESSFUL MYSTERIOUS ADVENTURES

These superbly written, Machine Code Adventures have been enjoyed by TRS80-VIDEO GENIE owners in Britain for well over a year now and are currently taking the U.S. by storm. The Author has now implemented these absorbing programs on the COMMODORE VIC 20 FITTED WITH 8K RAM PACK.

ALL ADVENTURES IN THIS SERIES INCLUDE:
Split screen display, Ultra fast Machine code response, Save game to cassette feature, Simple two word command entry, approx. 70 Locations to visit, 30 Objects to manipulate, 20 or more "problems" to overcome.

ADVENTURES PRESENTLY AVAILABLE:

1) THE GOLDEN BATON — venture into a strange province of danger and evil magic to retrieve the stolen Baton of King Ferrenuil.
2) THE TIME MACHINE — As a newspaper reporter you have been sent to the old house on the moors to investigate the eccentric Dr. Potter . . .
3) ARROW OF DEATH (Part 1) — In the first part of this epic Adventure you must find and destroy the source of the evil blight which has befallen your homelands.

These are the first three of a series which could ultimately total more than 20 Adventures.

WARNING! — Only supreme courage and low cunning can ensure eventual success on these dangerous missions.

SEND CHEQUE OR P.O. FOR JUST £9.95 INC. VAT + 50p POST & PACKING TO:

AVAILABLE SOON
* Escape from Pulsar 7
* Arrow of Death Part 2
* Circus
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ALSO
RAM CARTRIDGES
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8K £32.50
16K £56.50 + 50p P&P
Inc. VAT.

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SPECTRUM NEWS FROM ELR

EAST LONDON ROBOTICS

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32K Memory extension
(giving total of 48K. Upgradeable to SP80)
£25

SP80
64K Memory extension
(giving massive 80K)
£50

Both the SP48 and the SP80 fit inside the Spectrum case, are fully compatible with all Sinclair add-ons (ZX Printer, RS232, Microdrive etc.), are very low in power consumption, require no soldering, are easy to fit and remove and carry our full guarantee.

Transfer your ZX81 BASIC and machine code programs and data onto your Spectrum in minutes with the fabulous new

ZX SLOWLOADER
£10

SOFTWARE PRODUCT OF THE YEAR

This superb piece of software enables your Spectrum to LOAD programs from ZX81 tapes and automatically converts them to 'Spectrumese' ready for normal Spectrum SAVEing.

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Send s.a.e. for **FREE** catalogue to:
East London Robotics, Finlandia House, 14 Darwell Close, East Ham, London E6 4BT Tel: 01-471 3308

Prices include VAT. Please tick if you require VAT receipt ☐

Please rush me	Item description	Quantity	£	p
			P&P	45

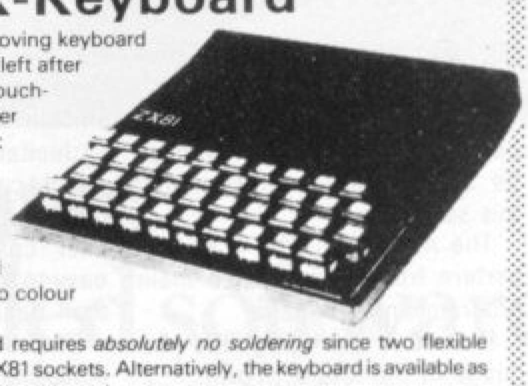
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Name Mr/Mrs/Miss ______ Address ______

EAST LONDON ROBOTICS—THE OPTIMUM SOLUTION

KEMPSTON (Micro) ELECTRONICS

ZX81 Klik-Keyboard



This is a full, forty key, moving keyboard which fits into the recess left after peeling off the existing 'touch-sensitive' keypad. Consider the following advantages:

* Positive feedback from keys
* Fits onto the ZX81
* No trailing wires
* No special case needed
* Elegant design with two colour legends.

The fully built keyboard requires *absolutely no soldering* since two flexible connectors plug into the ZX81 sockets. Alternatively, the keyboard is available as an easy build kit at a considerable saving.

Now available with 41 keys, the extra key can be used to give a repeat facility.

£22.50 (kit) **£26.00** (built)
41 key version: **£26.50** (built) **£23.00** (kit)

All prices inclusive of VAT, but postage must be added at 70 pence for a single item, 100 pence for 2 or more items. Payment by cheque or P.O.

Available by mail order from:

KEMPSTON (Micro) ELECTRONICS
60 Adamson Court, Hillgrounds Road, Kempston, Bedford MK42 8QZ

Please allow 21 days for delivery. S.A.E. in all correspondence.
See us at the PCW Show (also ZX Microfair)

Your Name and Address ______ C&VG1

Quantity	Description	Unit Price	Amount
	ZX81 Klik Keyboard kit (40 keys)		
	ZX81 Klik-Keyboard built (40 keys)		
	ZX81		

Date ______ Postage ______ Total ______

From page 89
pixels. It will be possible to make up your own graphics symbols.

Binatone are planning to buy in games software from a software house to support the machine, and are taking a similar attitude to Sinclair about peripherals, ie that specialist companies will provide them.

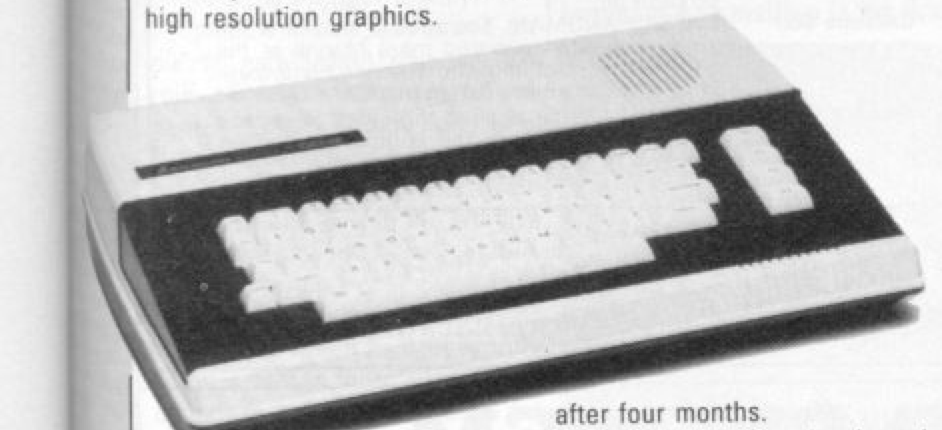
Final decisions still have to be made about the text display and the keyboard but Binatone claim that the keyboard will be a reasonable size and *not* touch sensitive.

COLOUR GENIE

The Colour Genie will be launched from the Lowe Electronics stable late in October.

The TRS-80 compatible Video Genie was one of the popular early personal computers and the company are producing the colour version at £199 inclusive of VAT.

It has eight colours, a 40 character by 24 line text display and high resolution graphics.



The computer will include a VERIFY command to help in saving programs and will also be bringing out a matching cassette recorder although Lowe claims that any good quality recorder will perform the loading and saving duties.

Where this machine scores over some of its cheaper rivals is in having close compatibility to its predecessor so that games with the colour added can be easily converted.

Already planned are 10 cassettes for launching in the first two months after the micro itself has been brought out. This range should increase to 25 cassettes after four months.

These are predominantly games software being written by independent companies.

Lowe is also supporting the computer with a range of peripherals which includes: a 16K RAMcard, joysticks, light pen and printer interface cable.

ADDRESS FILE OF MOST POPULAR COMPUTERS.

Atari 400
Atari UK, P.O. Box 59, Alperton-Lane, Wembley Middlesex HA0 1FJ

BBC Microcomputer
BBC Microcomputer Systems, P.O. Box 7, London W3 6JX

Dragon 32
Dragon Data, Queensway, Swansea Industrial Estate, Swansea SA5 4EH.

Sinclair ZX81 and ZX Spectrum
Sinclair Research, 6 Kings Parade, Cambridge CB2 1SN

T.I.99/4a
Texas Instruments, European Consumer Division, Manton Lane, Bedford MK41 7PA

Vic-20
Commodore, 675, Ajax Avenue, Slough, Berks.

ADDRESS FILE OF THE COMPUTER NEWCOMERS

Binatone
Binatone Electronics, Binatone House, Beresford Avenue, Wembley, Middlesex

Colour Genie
Lowe Electronics, Bentley Bridge, Chesterfield Road, Matlock, Derbyshire DE4 5LE

Commodore 64
Commodore, 675, Ajax Avenue, Slough, Berks.

Electron
Acorn Computers, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN

Jupiter Ace
Jupiter Cantab, 22 Foxhollow, Bar Hill, Cambridge CB3 8EP

Oric 1
Coworth Mansion, Coworth Park, London Road, Sunninghill, Ascot, Berks SL5 7SE

COMMODORE 64

The Commodore 64 is being marketed as a business machine but has many features which make it ideal for games players.

It comes with 64K of memory (although only 38K is available for Basic users) which is more than most games will ever require, but at a price of £299 it is still within many computer buyers' price range.

A 40 column by 24 lines text display with high resolution, pre-defined graphics characters and the movable object blocks or SPRITES makes graphical games much easier to program.

SPRITES can also be set up in eight layers giving a 3D effect. 16 colours and a strong sound chip complete the games-playing attributes of this machine.

But the manufacturers are only supporting the 64 with business software it may be some time before games software becomes available for this machine.

ACORN ELECTRON

Acorn has high hopes that its Electron microcomputer will find a ready market wanting to use BBC Basic at a cheaper price.

The Electron comes out at the end of the year but the company are still playing their cards close to their chest. It will have a 32K of memory and what they describe as a "full travel keyboard".

It will offer the same colour facilities and high resolution as the BBC Microcomputer but at a price of £125.

GLOSSARY OF TERMS

Basic: The most widespread computer language which is one of the easiest to learn and is used for programming all microcomputers.

Cartridge: A one-off computer program contained in a rigid plastic case. Cartridge programs plug directly into the computer and do not require a cassette recorder or a disc drive system to use them.

Cassette: Computer program stored on a cassette tape and loaded into the computer using a conventional cassette recorder.

Compiler: A computer program which can convert programs from one language to another.

Forth: An advanced computer language designed to have a large number of commands in plain English.

Graphics Mode: A facility which enables you to draw on the screen. Many computers feature a special mode for using graphics symbols.

Graphic symbols: Keys which enable you to build up a picture on the screen due to a variety of shades and shapes which they instruct the computer to produce.

High resolution: Drawing graphics in pixels, rather than shapes, which would be a collection of pixels.

Joystick: A small lever mounted on a plastic plinth which enables the player to move objects on the screen.

Memory: The power of a computer is measured in memory capacity. The greater the memory — the longer and more complex the programs that can be entered into it.

Microsoft Basic: A form of Basic.

Pixels: The basic element of a TV screen derived through various types of scanning processes.

Printer Interface: Device which enables you to connect a printer to your microcomputer.

Software: Another name for computer programs.

Software House: A company which produces games, educational, or business programs for computers.

Sound chip: A component specifically designed to store and reproduce sound effects within a computer.

Sprites: Programmable moving characters which greatly enhance the graphic capabilities of your computer.

Text display: The display of written information on the screen.

TRS-80: Tandy computer. Models I, II or III available at upwards of £300.

User Defined Graphics: Graphics created by the programmer with the graphics commands of the microcomputer.



WHAT PEOPLE ARE SAYING ABOUT OUR . . .

BBC MICRO GAMES

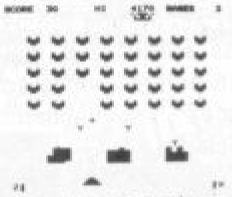
"... I bought all your tapes to date for the BBC Micro and I think they are just super, especially STAR TREK, and the sound effects in CANDY FLOSS really made me sit up! Well done and keep them coming".
J. S., Paisley

"... I was very impressed, not only with the cassette, but also at the speed at which it came!"
— R.L., Cheshire

"... I must congratulate you on your MUTANT INVASION cassette. I have had it for two weeks now and it is really superb. Incidentally, I have beaten your high score of 4,500 — mine is 7,580!"
— S.L., Berks

AND NOW LOOK AT OUR LATEST CASSETTES!

CASSETTE EIGHT
Model A Invaders

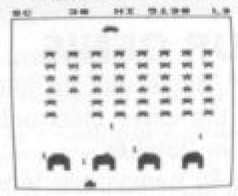


Actual screen photo

Cassette Eight contains Model A Invaders. A superb full feature machine code teletext colour graphics version of the popular 'Space Invaders' arcade game for the Model A BBC Micro. Choice of Invader and Missile speeds. FAST, SMOOTH AND GREAT FUN!
Only £4.95 inc.

Cassette Nine contains Model B Invaders. A superb full feature adaptation of the arcade 'Space Invaders' game in machine code and high resolution colour graphics for the BBC micro model B (or A + 32K). Play normal game or choose from the many options including Missile, Bomb and Invader speeds, Invisible/Visible Invaders and Shields/no Shields. Quite simply the best!
Only £6.95 inc.

CASSETTE NINE
Model B Invaders



Actual screen photo

CASSETTE TEN: WORDPRO. Cassette based word processor for either Epson or Seikosha printers. Features right hand justification, alter, insert, delete, save pages to tape, printer mode changes from within text line etc. etc. Complete with manual.
Only £9.95 inc. (Model B or A + 32K)

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FOR MODELS A AND B

Cassette One: STAR TREK (8x8 Galaxy, Klingons, Phasers etc) and CANDY FLOSS, the tremendous new game everyone is talking about! **Only £5.95 inc.**

Cassette Two: HANGMAN, KRYPTOGRAM, DICE, BEETLE, GRAND NATIONAL and MUSIC. **Only £3.95 inc.**

Cassette Three: MUTANT INVADERS (arcade game). Can you destroy the Mutants before they destroy you with their radioactivity. **Only £5.95 inc.**

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SANTA'S CHOICE

MORE THAN A TOY

The computer isn't a toy. But it can be a games-playing machine with a whole host of possibilities.

It can take the part of an opponent in the traditional games when there isn't a human one available.

Most computers now offer quite sophisticated chess programs which can play up to club standard. Reversi (or Othello), backgammon and draughts are games where the computer can usually beat all but the best human players.

Many games actually improve when played on a computer. Wargaming is an example where the location of a secret squadron can be left lurking in the computers memory until they spring out to surprise their enemy.

Computers can also prove an aid to established games. The role playing fantasy genre of games like Dungeons and Dragons, can now be catered for by computer programs which help plan and design the worlds, treasures and monsters needed for role-playing. A computer version of this type of game is, Adventure, which has proved so popular that there are now countless versions available on all types of machine.

But still the most popular games are the arcade variety, needing quick hand-to-eye coordination. These are very different from the early space invaders (although they owe a lot to their success).

Arcade games now use 3D graphics, offer different scenarios which require different tactics to master and some fascinating games concepts.

The latest generation of computers are quite capable of reproducing these, mirroring the speed which is essential to the play, the graphical detail so necessary to fleshing out the story-line and the sound effects which can drive the player to distraction.

These can be among the most demanding to program but certainly not beyond the determined home user.

It has taken the microcomputer industry a long time to admit that its current success is down to the common or garden space invader.

This time last year many of the micro manufacturers were openly disdainful of computer gaming and keen to give the impression that their machines were business tools.

Now the pendulum has swung the other way and the talk is of computers as toys and a £50 price tag is helping to promote that image.

The truth lies somewhere in-between. While many computers are used only for games, they are still much more than toys. Loading up a game of space invaders and blasting away to a high record with some frantic keyboard pummelling is the first step in the direction of a computer education.

The Basic language is a simple one to understand and most children over 10 can quickly grasp the way to print their name 40 times on the household's TV.

Basic is a simple and satisfying language to learn and it should not be long before the user starts using it to produce simple and ultimately, complicated games. While the games themselves may not be the most useful contribution to society, the programming skills needed to produce them can be very demanding.

Computers will play an increasingly important role in our society and learning to use them is going to be just as important. Games playing is as good a way as any of doing this.



Zaxxon: 3D graphics in the arcade

IN THE HIGH ST.

This year has seen microcomputers develop a "High Street presence" in stores like W. H. Smiths, Currys, Rumbelows and Dixons.

This has made them more visible and accessible but done little to help the uninitiated to appreciate just whay they are getting for their money.

Firstly make a checklist of all the hopes and aims you have for your microcomputer and the sort of games you would like to play on it.

Then go along to the computer dealer or high street chain and collar a salesman.

Make sure the salesman you have collared knows his way around the computer, he is going to be your first port-of-call if you need to go back for help later on. Don't let him confuse you with jargon, every computer term can be broken down into plain English.

Memory sizes are measured in kilobytes, usually abbreviated to "K". Rather than getting bogged down in what kilobyte stands for, remember that a 16K machine will be able to produce most simple arcade games. More complicated adventure games and arcade games will need 24 or 32K and a decent database of file will need over 48K of memory.

Get the salesman to demonstrate the graphics facilities. Most of these computers now come with a display tape but a good salesman should be able to show how to produce high resolution using DRAW and PLOT commands. Ask if user-definable graphics are possible on the machine — these enable you to draw your own space invaders.

What colours and sounds are possible. Look out for flicker at the edge of the screen and make sure the text on the screen is able to be read.

Ask to see a copy of the manual and look through a section to see if it includes examples of code and exercises for the user to try out and learn from. Is it expressed in plain English? Does it have a good index at the back and a good description of the chapters for easy reference at the front?

What software back-up is there for the machine and does it include the type of games programs you are interested in? Find out if the computer manufacturer supports his own machine with software or if it all comes from independent software houses.

Things like joysticks, light pens, printers and toolkits are known as peripherals. These are the add-on extras which can boost a computer's potential. Again check on the range and where these items can be obtained from.

The bugbear of many a computer owner is loading software. Ask the salesman to demonstrate a simple loading procedure to you and watch out for difficulties and excuses. Check if the machine needs a special cassette recorder and if so what additional expense this will cause.

THE KEY AREAS

Graphics, sound and memory are three key areas to look at when choosing a good games computer.

The memory will be needed to produce the text-based adventure games and the vast lines of DATA which they usually feature.

The graphics facilities should include high-resolution and user-definable graphics to help reproduce the arcade game quality of game design.

Ideally the sound chip should include a white noise voice to give the laser blast and explosion noises which are such a feature of arcade games.

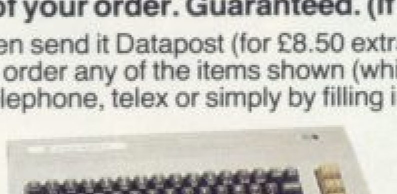
Eight colours will usually suffice for most screen displays and if the computer does not offer a good keyboard, check to see if there is a joystick available or you could end up frustrated at being blown up while pressing the wrong key.



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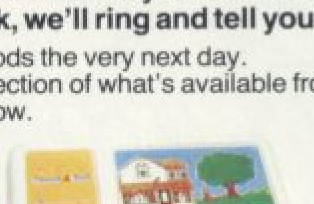
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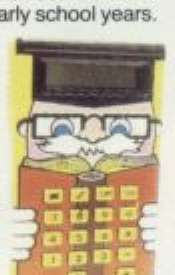
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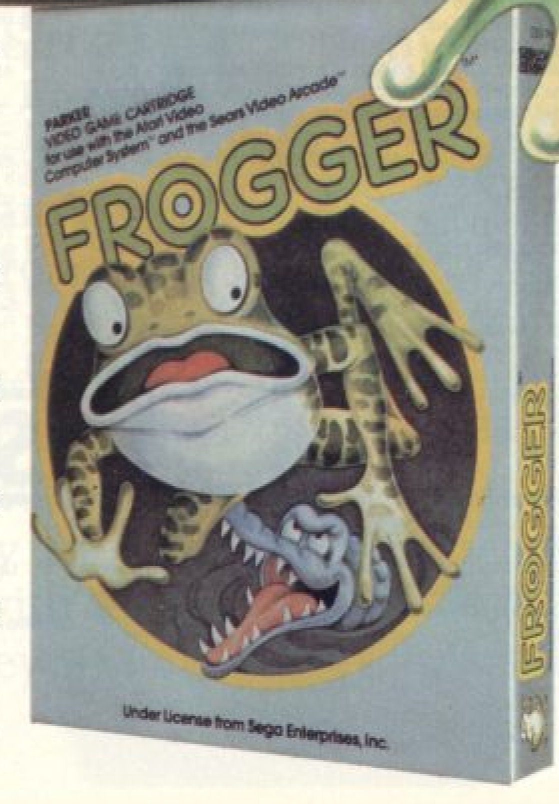
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REVIEWS

MAZE MAN WITH STICKY FINGERS!



PUCKMAN

With the disappearance of Bug Byte's excellent version of Pacman for the VIC20 under the threat of legal action from Atari — the owners of the Pacman copyright — we review another version of the game with the little yellow gobbler.

Puckman has all the principle features of the arcade game. The ghosts chase you through a maze full of dots which you must eat up as you go along. If you eat the power pills in the corners of the maze you can then eat the ghosts for a brief few seconds to score bonus points.

Every so often a bunch of cherries appear in the centre of the maze which, if you can manage to eat them are worth a lot of extra points.

The graphics are surprisingly clear considering that the game is written for the unexpanded VIC.

My main criticism is that the Pacman is difficult to negotiate through the maze as the keys that move him tend to stick.

Once you press a key to move him he will continue in that direction even when you take your finger off the key.

Puckman is available from Mac games of Port Talbot at £5.50.

- **Getting started** 8
- **Value** 7
- **Playability** 6

BEWARE THE BLACK RIDERS

SHADOWFAX

Shadowfax, as Lord of the Rings fans will know, is a horse belonging to Gandalf the White Wizard — the swiftest horse in Middle Earth.

This is your chance to ride Shadowfax as you gallop against the Black Riders of Sauron — the Dark Lord of Mordor.

The idea of the game is to shoot as many of the advancing Black Riders as possible. To kill the riders you must release a thunderbolt by pressing the shift key. You must quickly release the key again when the bolt is centred on a Black Rider. This will cause the bolt to explode — killing the rider — which will then glow red and gradually fade away. If you fail to release the key quickly enough the bolt will pass through your target and leave him unharmed.

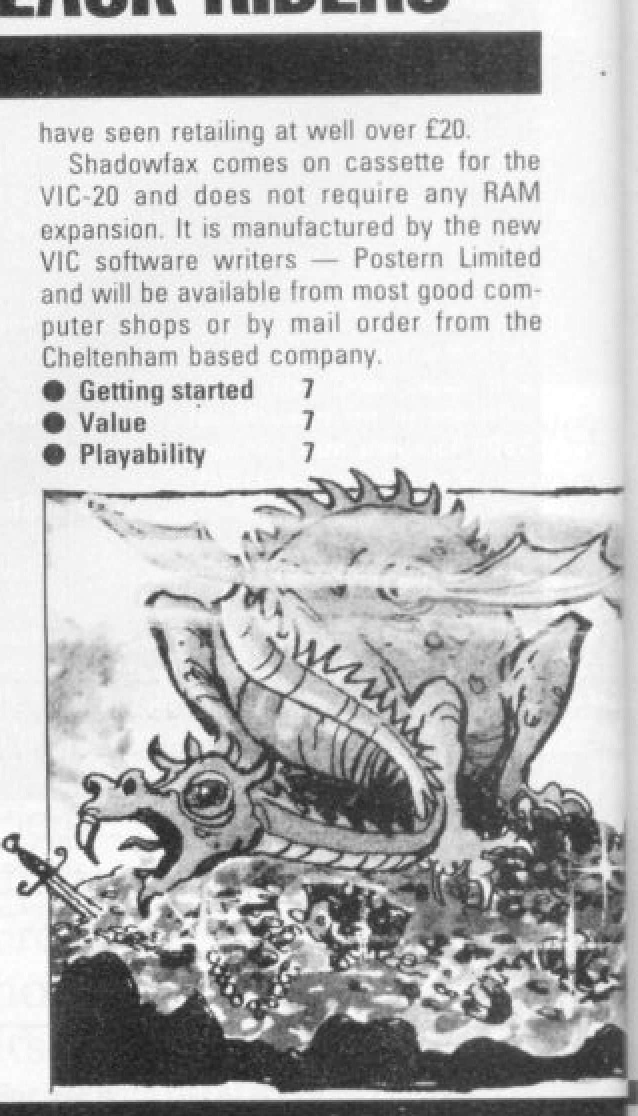
But it's the graphics on Shadowfax that are truly impressive. The horses look — and sound — most lifelike.

My one criticism of the game is the lack of variety in terms of opponents. It would have been really nice to have a few Orcs and Elves to deal with as well as the dark riders.

Despite this — my overall impression was of a most enjoyable and compulsive game. At £6.99 Shadowfax is every bit as playable as some of the cartridge games I have seen retailing at well over £20.

Shadowfax comes on cassette for the VIC-20 and does not require any RAM expansion. It is manufactured by the new VIC software writers — Postern Limited and will be available from most good computer shops or by mail order from the Cheltenham based company.

- **Getting started** 7
- **Value** 7
- **Playability** 7



VICTIMS OF THE FISHY PIRATE

SHARK ATTACK

The sharks are after you, jaws agape and hungry for flesh. Your only escape is to trap them in your yellow net which you trail behind you as you swim away from them.

The game is made more difficult by the fact that the sharks keep chomping away at the net, biting out holes large enough for them to escape.

If you manage to hem in all the sharks little green octopi will begin to appear — from whom you must also escape, or be dragged to the bottom of the ocean by their icy tentacles.

The key to success in Shark Attack is to manoeuvrability. You have to choose just the right second to dash in with your net and trap a fish.

But be careful when you get close to one as they are programmed to turn towards you.

My main gripes were with the graphics and the packaging. Pirates are mentioned on the packet: "You are . . . thrown overboard from a Pirate ship".

I was expecting pirates to appear on my TV screen with a look in their eye as if to say: "Watch out you pesky VIC owner we're going to throw you to the sharks". But alas, no pirates.

The sharks were pretty disappointing too. If they resembled any sort of swimming creature at all I would say a tadpole was the nearest.

The octopi were a little more realistic than the sharks but appeared to stay still.

It would have been better if they had pursued your little man with the sharks.

This reviewer failed to get the little green beasties to do anything.

Despite my reservations I did find Shark Attack a most playable game. It's not easy to trap the sharks, and you really can't stop until you've succeeded.

In fact the game had several members of the Computer and Video Games staff hooked from the moment we plugged in our VIC!

Shark Attack runs on an unexpanded VIC and is available from Slough based Romik Software at £9.99.

- **Getting started** 7
- **Value** 5
- **Playability** 8



ALL'S FAIR ON THE FAIRWAY

PREPPIE

Just when you thought it was safe to go back on the golf course — here comes Preppie!

This is a Frogger type game in which Preppie — the American slang word for junior school pupils — has to collect golf balls from an extremely dangerous golf course.

And it's not just an easy afternoon stroll for little Preppie — danger lurks around every runaway ball!

The first problem he encounters is actually getting across the fairway. There are nasty lawn mowers which he must dodge as they criss-cross the course. If he manages to avoid the mean mowers there's a river to cross. He has to jump from barge to barge as they float serenely down river.

As the game progresses the lawn-mowers transform into golf carts and then — would you believe — Bulldozers! The barges perform a strange metamorphosis into floating logs and there are crocodiles as an added hazard in the river.

Just to make things even more difficult the game speeds up as you reach the different stages.

A further hazard is a frog which appears on later screens and leaps along the previously safe riverbank squashing everything that gets in its way. So by the time you reach the sixth screen you are really being tested. And it doesn't end there!

The game uses multi-colour high-res graphics, and it is unlikely that you will find such quality in any other game out at present.

Another excellent feature is the music. As Preppie runs around collecting golf balls the computer plays three catchy tunes.

At £20, this cassette produced by Adventure International, is a must for all 16K Atari owners.

- **Getting started** 9
- **Value** 9
- **Playability** 9

REVIEWS

LET'S HUNT THE INVADERS

INVADERS FOR THE SPECTRUM

As the race continues among software houses to produce games for the Sinclair Spectrum we decided to test the three Space Invader games that have so far been produced for this fledgling machine.

Spectral Invaders was the first game on the market for the Spectrum and marked another first for the Liverpool firm Bug Byte.

The game is a fairly authentic version of the arcade classic. It loaded without difficulty and started according to the instructions.

The main drawbacks were that the gun turret responded slowly to the keys and did not explode until a split second after it had been hit, continuing to move right or left. The missiles were also slow movers — jerking awkwardly skywards.

The Invaders themselves did not explode immediately they had been hit either — causing you to hesitate, unsure if you had hit them or not.

On the plus side Spectral Invaders was the only game of the three we looked at that offered a two player game. It had the fastest and most authentic mystery flying saucers. It also had the best score board, flashing to indicate player one or two.

Despite its faults, Spectral Invaders was the only version that looked and felt at all similar to arcade Space Invaders.

Psion Software — the official Sinclair software writers — entered the field with Space Raiders, the slowest version we tested.

The Invaders don't move down the screen in vertical columns in this version making them particularly easy to hit. Their side-stepping motion means that the gaps between the columns are blocked so you can hardly fail to hit something once you get a missile in the air.

The mystery flying saucers didn't look too much like flying saucers and moved so slowly they could be picked off with ease.

About the only department in which the Psion game beat the other two versions was sound. The Spectrum produced clear well synchronised bleeps as the ships exploded.

Space Raiders loaded well — the Psion logo appearing seconds after the play button on tape was depressed — cutting out some of the nail-biting I experienced with other Spectrum games.

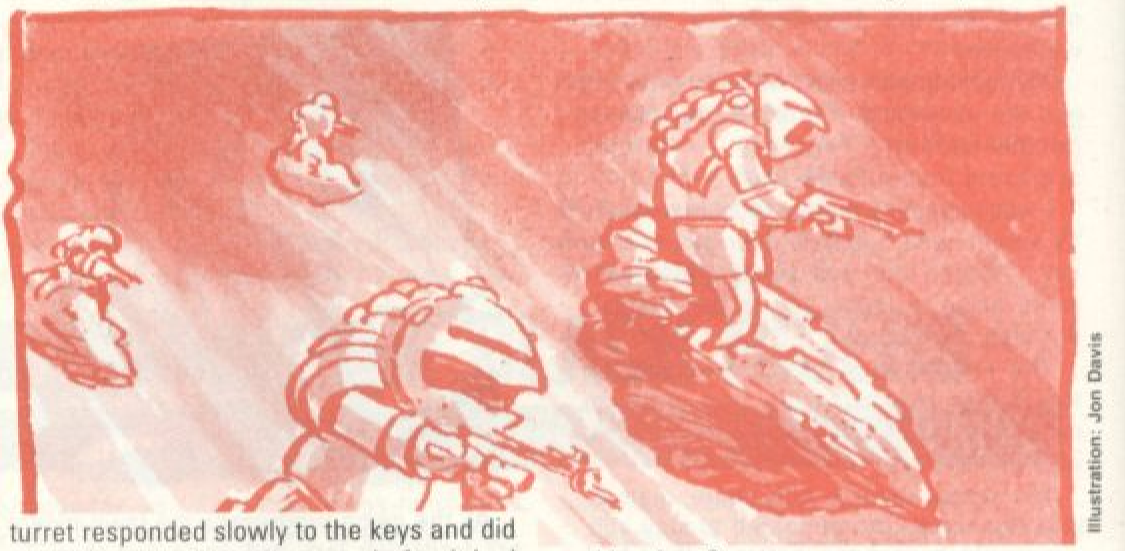


Illustration: Jon Davis

Southampton firm Quicksilva were hot on the heels of Bug Byte with their version of Invaders for the Spectrum — Space Intruders.

This was the fastest of the three games. So fast in fact that it detracted from the playability of the game. Not because it made it impossibly difficult, but because you had such a speed advantage over the advancing fleet that you could shoot them down with ease.

The missiles could be fired far too fast and furiously. You could kill a whole column of Invaders in a split second, sometimes without dodging right or left, which in turn made the fleet relatively easy to defeat.

In fairness to Quicksilva their version does have a number of features which the others do not.

Most useful of these is a hold button which enables you to answer the phone or make a cup of tea and then continue where you left off when you are ready. It also has a high score facility which enables you to

SOFTWARE SOFTWARE SOFTWARE REVIEWS

enter the top ten high scores of the session with the initials of the players.

Space Intruders displays clear instructions on the screen and also gives you the value of the various Invaders. Extra features are, however, no substitute for a good playable game, which I do not feel this version from Quicksilva gives you.

For my £5 Bug Byte offers the best game of Space Invaders on the Spectrum so far.

Bug Byte
- **Getting started** 7
- **Value** 7
- **Playability** 7

Quicksilva
- **Getting started** 6
- **Value** 6
- **Playability** 5

Psion
- **Getting started** 8
- **Value** 4
- **Playability** 4

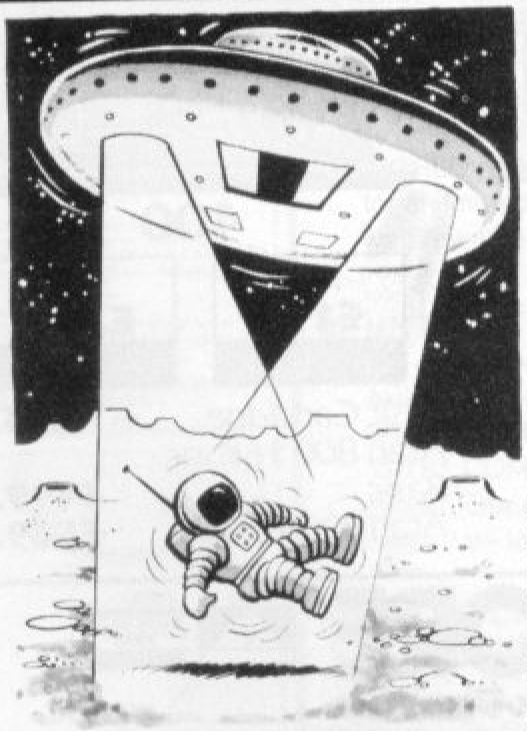


Illustration: Terry Rogers

SMART BOMBS, SMART GAME

DEFENDER

Defender is not a game you can pick up in five minutes before leaving for a dinner party . . .

Three hours later you will be cursing the anxious would-be host for phoning to interrupt you while you still had a smart bomb and three humanoids left on wave three.

In the arcades, Defender players earned their expertise through a mint of 10p's. On the BBC Model B Microcomputer, you have to be prepared to sacrifice time — lots of it — to enjoy the satisfaction of smart-bombing the Pods at the start of wave three.

A lot of people are put off Defender by the vast range of control buttons. There are seven of them: Up, Down, Thrust, Fire, Smart Bomb, Reverse and Hyperspace.

At the start you doubt that you will ever master them but slowly the game starts to make sense. Up and Down come first, then remember not to Thrust too quickly and don't spare the Fire button unless the humanoids, you must defend, are climbing into dangerous positions on the mountainous scenery.

Soon you will have cleared the first wave of 15 Lander aliens and found yourself just starting to gain confidence in Reverse and thumping down on the Smart Bomb in tight situations.

For the uninitiated, Defender puts you in a craft above a bumpy landscape, charged with the task of stopping aliens kidnapping humanoid figures from the surface.

The most dangerous opponents are the Mutant, Baiter and Swarmer craft but you are responsible for the appearance of all of these.

Mutants only appear if you let a Lander craft steal a humanoid to the top of the screen.

Baiters, only if you dally too long on one wave and Swarmers only come into the game when you blow-up a harmless Pod — so only do it when you are ready to deal with them.

In Defender you are responsible for everything that happens to you. And even the "easy" first wave is crucial to your future survival in the game so treat it with due respect.

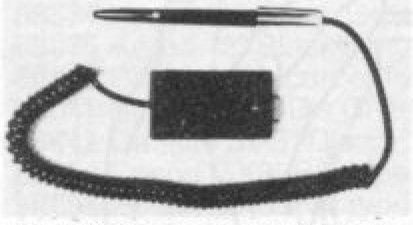
Extra lives are awarded every 10,000 points, an extra Smart Bomb too, but a new batch of humanoids is only given to you each fourth wave. And if you lose all your humanoids, all hell is let loose.

When you have just flown your last man into a pack of Swarmers, quite forgetting that you still had another Smart Bomb left and the split second the machine takes to set up a new game seems like a frustrating eternity, you'll realise why Defender has enjoyed such a long reign as king of the arcade games. Sheer compulsion at £9.95 inclusive of Vat.

- **Getting started** 7
- **Value** 9
- **Playability** 10

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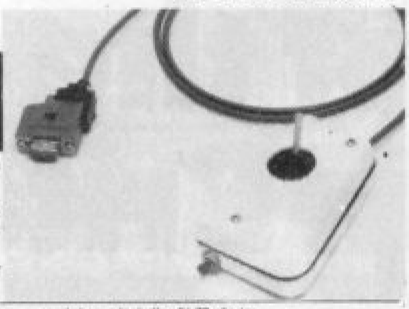
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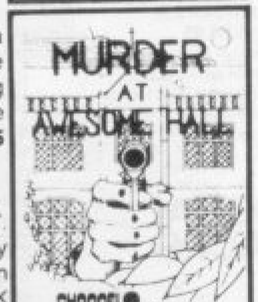
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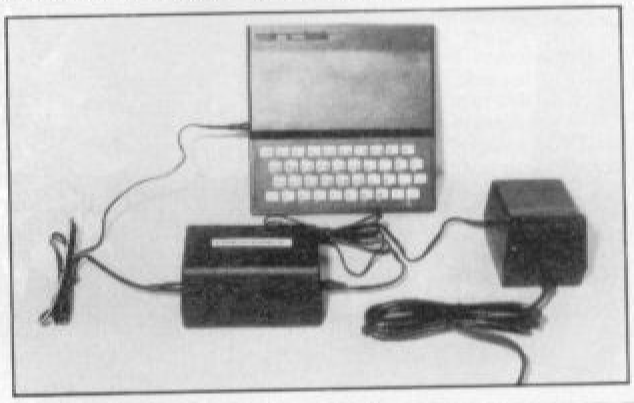
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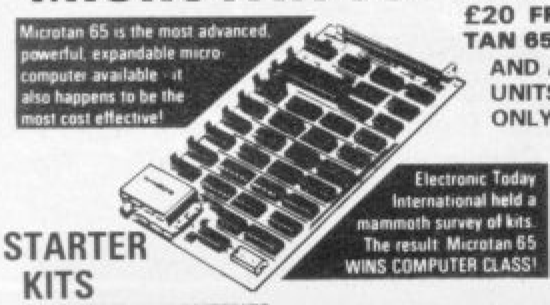
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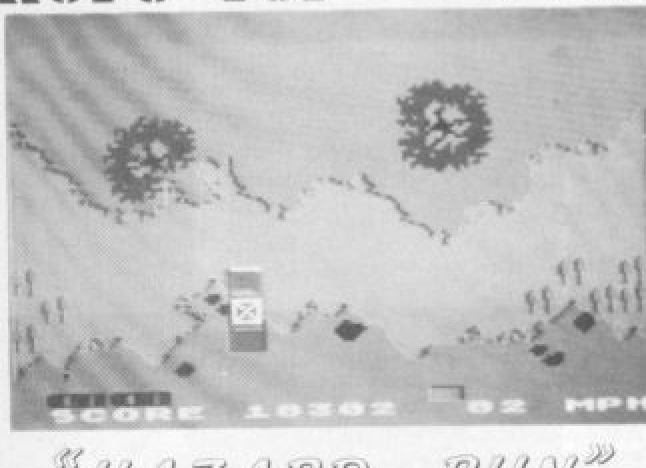
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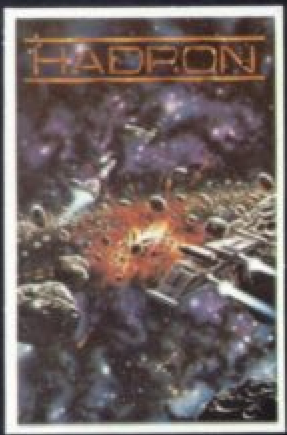
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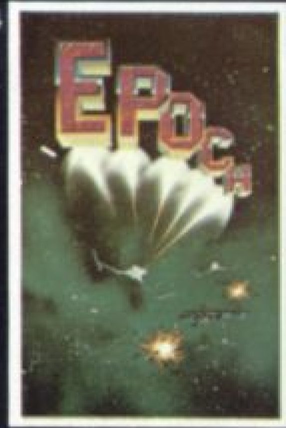
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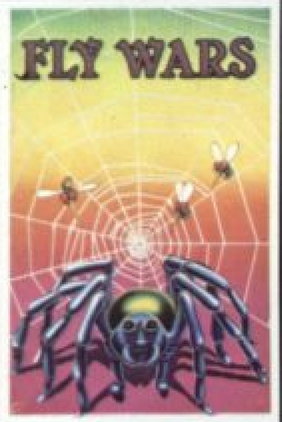
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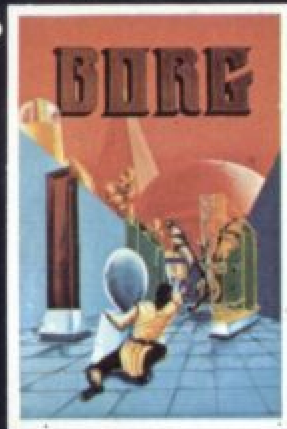
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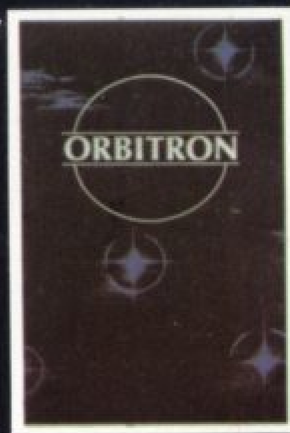
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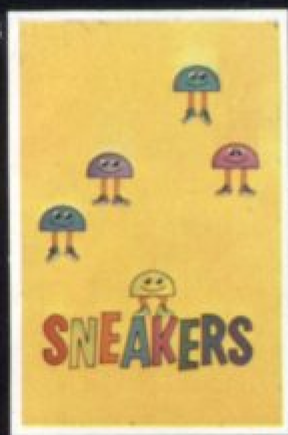
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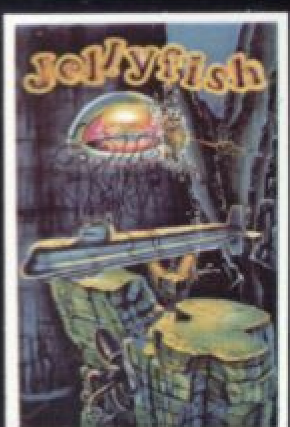
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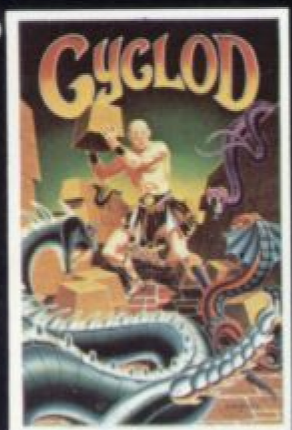
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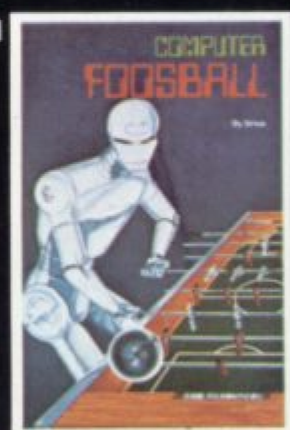
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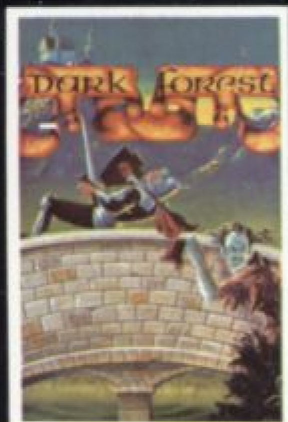
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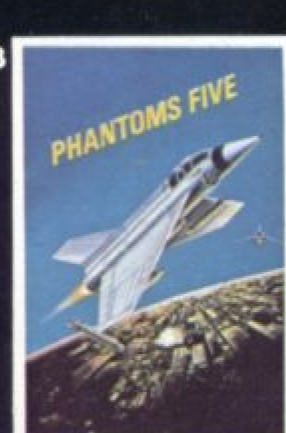
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